Design and Implementation of an Information Management System for Comparative Test Organization

Wei Bian[a,*], Weifeng Che, Jihui Yang

School of Noncommissioned Officers, Army Academy of Armored Forces, Changchun, Jilin, China

[a]18943150578@189.cn

*Corresponding author

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Abstract: This paper combines systems engineering ideas with top-level design as the main thread, integrating the corresponding technical documentation system and writing standards to develop an information management system for comparative test organizations. The purpose of this paper is to provide a useful, effective, and practical tool for the development of comparative testing, aiming to achieve functional goals such as improving organizational efficiency, reducing organizational difficulty, standardizing organizational processes, and managing test schedules. This paper features five modules: system subsystem management, business management, organization and implementation, process control, and data management. After testing through experiments, we find that the system works well, and the software and hardware are highly compatible, allowing it to be put into normal use.

1. Introduction

An activity in which the status of equipment, machinery, or a system is compared and tested. It specifically refers to the use of the same test unit, the same test outline, and participants from competing units under the same conditions for comparative testing. This avoids the results being non-comparable due to differences in test conditions, test methods, and other factors in the scientific research tests of the competing units[1].

2. The purpose and configuration of the design and implementation of the information management system for comparative test organization

The implementation of the information management system for comparative test organization experiments is mainly based on the corresponding technical document system and compiling standards. It provides a supporting platform for the organizers, implementers, and managers of the comparative test, which can improve the efficiency of the organization, reduce the difficulty of the organization, standardize the process of the organization, and manage the progress of the test. The system is based on J2EE architecture design, all technology stacks are open-source technologies, and there are no version constraints. The database uses MySQL, caching technology uses Redis, and message queuing uses RocketMQ. Business-level integration supports special functions such as picture uploading, chart uploading, table uploading, online editing, and formula calculation, etc. In terms of future business expansion, the system architecture needs to build the basic data platform while providing the functions of the current business system, provide standardized data interfaces, and interface and data fusion with other future business system foundation data to ensure future business system expansion and seamless integration. The database and cache adopted by the system need to support cluster deployment, which can continuously scale to meet business system requirements. The system is built in the form of dynamic UI and multi-document windows to interact with server and client applications for distributed deployment. Using dynamic modular design and LayUI for business logic implementation, it uses MySQL database to store system data.

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3. System function design

The design of the system comprises five main modules: system management, business management, organization and implementation, process control, and data management.

3.1. System management

3.1.1. Account management

In addition to the administrator account, the business system uses roles fixed for four categories, namely, members of the subject group, Business Department leadership, leadership in charge, and unit director. Account management is conducted by pre-registration and background audit.

(1) Account registration and login

Users can log in on the home page, and they can also register.

(2) Account audit

The backstage administrator, according to the front desk account application, can unify the audit of account information. The audit results include two kinds: pass and reject.

3.2. Business Management

The business management is divided into five parts: template management, standard management, task management, case maintenance, and autonomous learning. At the same time, according to user business needs, it can be divided into four parts: data entry, online editing, self-learning, and download and save.

3.2.1. Template management

According to the user-given 12 sets of standard data templates, the system needs to be designed to allow users to define their own segmentation blocks, so that large templates can be partitioned for data entry. At the same time, users can set whether each template has the business requirement for automatic directory generation. After a template is divided into several blocks for management, because each block needs to have data input separately, in order to facilitate better maintenance, it is necessary to set a title for each block.

(1) The design of online Web editor

The design of the online web editor varies from template to template, but it does not allow for one template to be developed and one web application to be used. The online web editor is designed to be a tabbed tool that can be formatted as a template, with rows defining the data to be entered on the page. Its advantage is that each field set allows you to set the specific field in the data entry process to the corresponding sub-tips, making the data entry operation more convenient.

(2) Design of online Web editor platform

The advantages of designing an online web editor in parallel with an online office editor are that it can be dynamically designed in the early stages of the design phase according to a template determined by the user and in accordance with certain rules. The disadvantages are that the data record and entry requirements are very standard and must be in accordance with the pre-set rules for entry. However, many pages in the user template are more cumbersome, such as the table input line number of uncertainty, qualitative nature, whether to input chart formulas, some templates have two-level titles, three-level titles which are uncertain. Therefore, the flexibility of the data entry stage requires the design of a set of online office editing tools. In the template, after the block of each attribute, post-management can set whether the block needs to use online office editing. If this module allows for more flexible data input, it is necessary to use online office editing tools for management. Administrators confirm and subject group members input data into the block, the system can automatically adjust, using online office editing tools, the data inputting person may arrange the data input content and format independently.

3.2.2. Standard management

The system currently has 12 templates in place, each of which requires a set of authoring standards; therefore, the system is required to design a template-entry authoring function.

3.2.3. Task management

In the current business system, within a fixed three-phase framework, an administrator can create and assign multiple tasks. Each task allows for the management of multiple technical documents. Each document requires the setting of a template, with each template having an associated authoring standard. These tasks manage business requirements and control processes.

3.2.4. Case maintenance

The administrator in the background can, based on the actual situation of each template, upload a number of model cases for all to learn from, including online preview and download.

3.2.5. Autodidacticism

All users of the system can learn online according to the three stages, different tasks, templates, and demonstration cases entered by the back-office administrator. This includes inquiry, online preview, and download. The design of the autonomous learning function is divided into two aspects: first, according to the stage and task, using the technical document knowledge tree for navigational learning.

3.3. Organization and implementation

3.3.1. Project management

After self-study, the project management team members can create and manage projects.

When a new project is created, it is necessary to enter project attribute information: item name, participation, unit, work content, person in charge. At the same time, data can be filled out for this project, the system needs to fill in the data file of this project automatically according to the main stage, different tasks, technical documents (reference template, standard, model case) that the administrator has entered. After filling in the data file, you can directly apply for an audit. The data file submitted for review has entered the three-level approval process control stage. During the process of data filling, the system needs to automatically call the template information set by the Administrator: Web Editor or online office editor Data Entry Page. In the process of data filling, the members of the research group can preview and download the template of each piece of data, and also can preview and download the whole data template. After filling in the data, the whole data template needs to realize the whole preview function, the system needs to retrieve each template, you need to merge the data files entered by the online web editor and the online office editor to determine whether the current template uses an automated directory system, word files are generated by automatically adding directories to data files for users to preview and download online.

3.4. Process control

The subject group members, in accordance with the technical documents, should fill in the data file upon completion and can then directly review it according to the data file. After the audit, the data file will be integrated into the process control business process.

3.5. Data management

Data management includes data archiving and archiving queries.

Data Archiving: Members of the study group can review technical documents, archive them by stage, and task data archiving. Data archiving requires the ability to upload images or files and supports batch uploads.

Archiving Queries: Members of the project group can retrieve archived documents through conditional queries and keyword queries, with the ability to preview and download the results online.

4. The system key technology design

4.1. All the system code based on Java technology development

The development framework uses the domestic open-source JFinal technical framework, which is

characterized by rapid development, less code, simple learning, powerful functions, lightweight, easy expansion, and Restful. It is an extremely fast Java development framework.

4.2. The database database uses the open source database Mariadb10 series

MariaDB is a branch of MySQL designed to provide better performance, stability, and compatibility. While MariaDB and MySQL have many similarities, there are some important differences between them. With MySQL being acquired by Oracle, MySQL will gradually close down, making MariaDB a better alternative to MySQL.

4.3. Database

The cache uses Redis 6.0. Considering the number of users of the application system, the cache method is designed in detail at key points that may cause access pressure, such as login, etc. Pre-read the user's login name and password into the cache in advance, so that large-scale users can quickly hit the cache when logging on during the week, to prevent stress concentration points.

4.4. Office online editing platform

The Office online editing platform realizes the browser-based online editing and preview function of Office files, so that end-users do not need to install the Office software system. At the same time, it also solves the problem for terminal customers who, because of the installation of various versions of the Office software system, encounter file version incompatibility issues. In terms of technical selection, the office online solution based on Microsoft was not chosen, but rather the open-source Qnlvoffice technical solution was used, fundamentally freeing the project from dependence on the Windows operating system and commercial software, allowing the whole project to be migrated to a domestic Linux operating system at any time.

4.5. Web graphic input form designer

The system, designed for user-specific needs based on the Web page, allows users to customize the input form designer. This function enables users to enter data according to their own template and design the input data form style. For example, it lets topic group members input technical information and file data, specifying whether to input single-line text, multi-line text, pictures, tables, etc. At the same time, the system supports a data input accuracy check function.

4.6. The automatic directory management function

The system is based on the user template and realizes automatic directory management and management functions according to the title level. After the project manager inputs the related data according to the template specified by the user, the system automatically forms the whole document in Word format and realizes the automatic typesetting of the catalogue.

4.7. Automatic fusion data entry management function

The system employs an online office integrated with a web graphic input form designer counter to enable a technical file to be divided into multiple blocks that project management personnel can input. Simultaneously, managers can freely set the use of a certain section of the directory based on the ease of the template for technical documents, including whether to utilize the online office editor. Once the manager determines the settings, the project manager of the project team should input the specific data content according to the template rules established by the manager. The system realizes the automatic merging function of different block files based on online office editing and web graphic input form design.

5. Conclusion

The comparison test organization implements an information management system for comparison testing. This has positive significance. This article studies five modules of the system. Through system and performance testing, the software and hardware can be highly matched. It meets the

current design needs of the target and can be expected to be put into normal use.

References

[1] Jiang Naishen, Lin Jingxing, Zhang Lizhen, etc. Measurement service system based on Android technology, research and application [J] . China Measurement, 2022(8): 91-93.

[2] S.Ilhan, E.A.Cherney.Comparative tests on RTV Silicone Rubber Coated Porcelain Suspension Insulators in a Salt-Fog Chamber [J].IEEE Transactions on Dielectrics and Electrical Insulation, 2018(25):947-953.

[3] Jinhe,HU,Fei ZHU,Xiaolin CHENG,Yuping HU,Fengqin YU.Comparative Test of New Late Indica Hybrid Rice Combinations with Good Quality[J].Agricultural Biotechnology,2021(4):114-117.