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Synchronous Digital Development Design Review Process Research

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Abstract: *In this paper, in order to solve the present situation of automobile manufacturing performance updates fast, cost control and customer quick aesthetic changes, etc., systematically combed the synchronous development design review the requirements analysis and general design of digital process, put forward the MVC models for the system design of the digital technology review process research, analysis of the composition of its system and each module function. It has theoretical and practical significance for standardization and digitization of design review process of synchronous development.*

Keywords: *Process review, Digital process, Evaluation software system*

1. Introduction

With the development of computer science and technology constantly, and the degree of electrification and intelligence is higher and higher, the variety of functions and system of cars continues to increase, usually the more complex functions and system more prone to errors. Therefore, in addition to need to meet the requirements of practicability and safety, it also needs to balance cost optimization and customer's aesthetic. Constantly reviewing the design document at the design stage is necessary. Simultaneous development of digital process review that this paper research on can be faster and earlier to find problems and optimize the review process.

2. Synchronous Development of Digital Process Review Overall Design

2.1. Requirement Analysis

Software requirement analysis is a particularly important link in the process of software system development. Firstly, it is necessary to conduct requirement research on the whole process of process review, and then conduct requirement analysis according to the scope of synchronous engineering process review and the digital process review. Process review information can be modeled into a review standard model. Output the evaluation results by automatically comparing the items to be evaluated with the evaluation criteria. The entire synchronization process review cycle is time consuming and complicated, the artificial alignment process evaluation method can solve the drawbacks of the existence. Replacing the artificial alignment process evaluation not only saves the manpower, but also improves for multiple process review efficiency, finally, forming a digital synchronous development process review.

This paper takes functions and controllers as units. The review standards of synchronous development are sorted out and corresponding review norms are formulated. At the same time, the test requirements associated with the review criteria and the test logic associated with the test requirements are sorted out. To achieve automatic access to review items, call evaluation criteria, associated test requirements and test logic.

2.2. Overall Design

All in all, the overall design of the digital process of synchronous development process review needs to solve the following problems: how to implement the digital process of synchronous development in the process of review; How does the system stores and obtains the design details associated with the automatic review items; How does the system is designed and stores review criteria associated with design details; How to design the review model in the review form and how to establish the correlation between the review standard and the review model.

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For solving the above problems, this paper conducts software system overall design according to the characteristics of the digital process of synchronous development process review, through the design and development of synchronous engineering management system and then implement the management of the digital process of synchronous development process review. The synchronous engineering management system aims to solve the problems existing in the process of synchronous development process review and realize the digital automatic process of synchronous development process review.

3. Software Design Patterns and Architectures

3.1. Design Mode

According to the characteristics of the digital process of synchronous development process review, in the whole life cycle of software, the design of software system is the key link of software development, which is based on the requirement analysis of the system [1]. The focus of software design pattern is to provide a common solution to various recurring design-related problems and design experience that must be repeated and fully perfected. Software design pattern represents the highest level of software system design.

The software design mode provides an overall design scheme for the whole software development process. Describing the structure of the entire system from the perspective of specific component functions can effectively speed up the development of the software system. It can not only reduce the coupling between various components of the system, but also facilitate the maintenance of the system in the later period. This enables engineers who are new to the system to understand the whole system in a shorter time. Enhancing the stability of the system brings convenience to the later extensibility of the system [2].

As early as in the 1970s, the concept of MVC (Model View Controller) design pattern was put forward, namely, business model, user interface and controller. The MVC pattern was used to separate M and V codes, which had the characteristics of low coupling, high reuse, fast deployment and high maintainability. It is mainly used for the development of Web applications, which is the main mode of software development at present. The characteristics of MVC design pattern are utilized to complete the study on the digital process review of synchronous development. The structure of MVC pattern is shown in Figure 1:

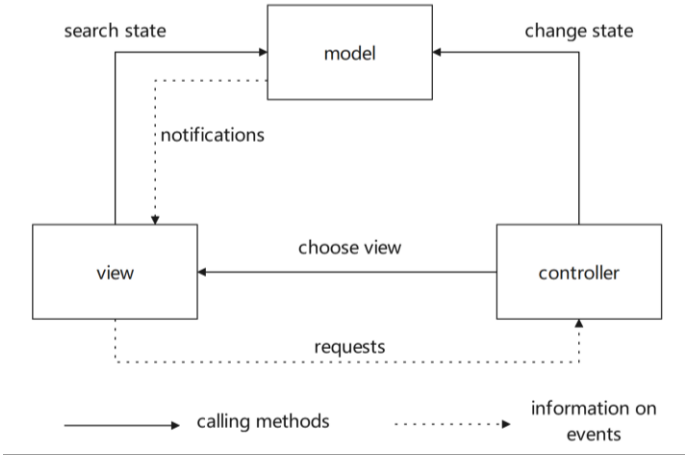

Figure 1: MVC pattern structure diagram.

3.2. General Framework

Planning a complete system framework of synchronous engineering management system which can meet the requirements of synchronous development process review digital process research is the prerequisite for all work, and also lays the foundation of system performance. It is crucial for the development of a software system. The system architecture should be hierarchical organization, and the modularized system functions should be low coupling, which can be more convenient to modify, reuse and deploy according to the actual needs, and then meet the requirements of elastic expansion of the system in the future.

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The system is divided into application framework, technical framework, and system framework. The application framework meets the basic application services of access control, permission management, user management, and other applications, as well as application templates of form templates and interface templates. Technical framework is divided into login authentication, exception handling, database connection, log management, cache processing, data encryption and Struts framework, JSP tag, UI application technology framework and technology; The system framework is server operating system and database. The overall framework of the system is shown in Figure 2:

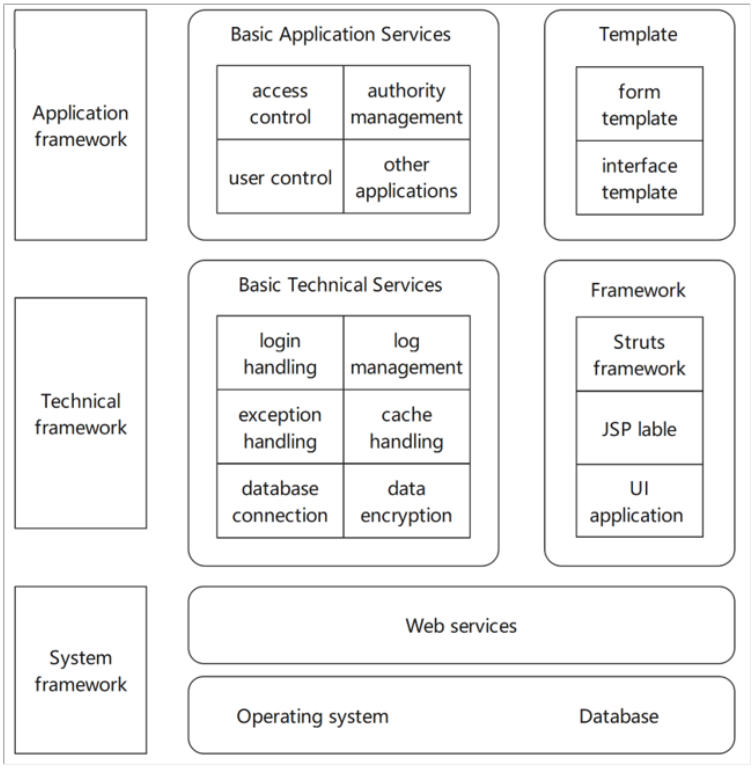

Figure 2: System overall framework diagram.

4. System Composition and Function

After the usage requirements of the software system have been clarified and the software design mode and overall framework have been confirmed and completed, the designers of the software system can carry out modular design for each function point of the system [3]. According to the system requirement analysis, the functional module of the whole system is divided into six modules, which are login, establishment of review task, review report query, establishment of review model, database management, management settings. The modular design makes the system has a higher degree of extensibility, and is easier to modify and optimize according to the actual demand.

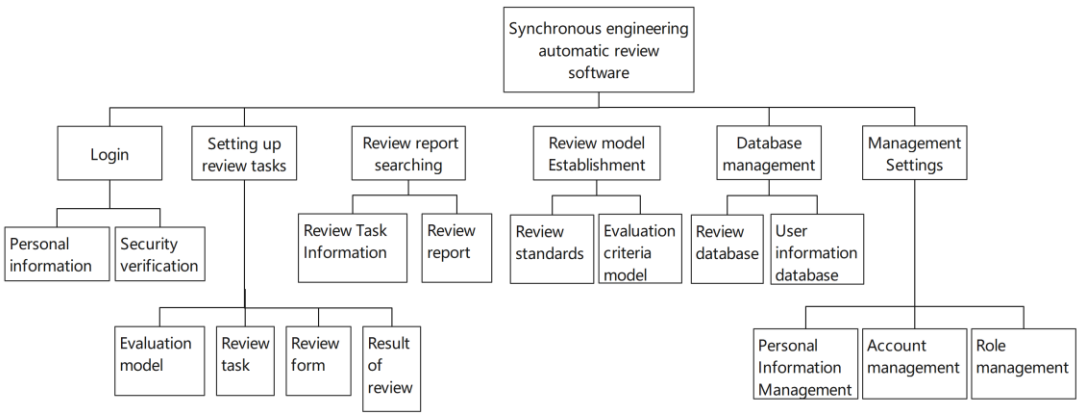

Figure 3: The functional module diagram of the system.

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Module 1: Login, any user can log into the software system safely; Module 2: Establishment of review task. Review engineers can create review tasks, create review forms, select or create review models according to existing data, conduct automatic review and get review reports; Module 3: Review report query, any engineer can check historical review report; Module 4: Establishment the review model. Engineers establish review model for review items according to review standards; Module 5: Database management. The administrator of the database forms has deleting and checking permissions; Module 6: Management settings. The administrator has account management and role management functions. Review engineers and administrators have access to the personal information management function. The functional module diagram of the system is shown in Figure 3:

5. System Detailed Design and Interface

According to the requirement analysis and the system composition and function, we complete the detailed design and interface for the software system, carry on the relatively complete analysis to the software system design.

The login module of the system is the basic module of the system. During the design process of the synchronization hero management system, the system can only log in to the account maintained by the system on the login interface. If engineers forget the password, they can click "Forget the password" to display "The administrator email". The system will let them to contact the account of the administrator. The administrator can add, delete, disable, reset the password, and change the permission of the account by maintaining the account information in the management setting module.

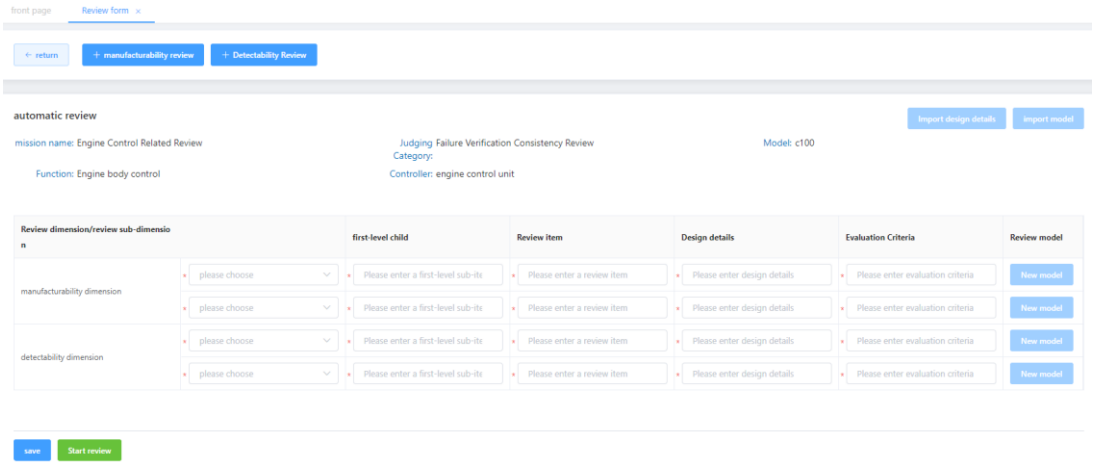

Figure 4: Review form page detail diagram.

The establishment of review task module of the system is displayed on the page with an independent menu. The basic information of the evaluation task is displayed on the page. The evaluation task of line management can be searched by index condition, and the evaluation task can be added and edited. Engineers can click to enter the review form page. Manufacturability review and predictability review can be added at the top of the review form page (review dimension is divided into manufacturability dimension and predictability dimension). Buttons for importing design details and importing model are placed on the upper right. Review form page details for automatic evaluation form, display task name, evaluation category, model, function, controller, review, review dimensions, level 1 item, the inspection items, design details and evaluation standard all are mandatory. The evaluation standards on the right side of the evaluation model of column shows the new model/edit button. Below are the save and Start review buttons. Operation on the page to add review dimensions (manufacturability dimension/ predictability dimension) can be detected, then select the sub-dimension corresponds to review dimensions (the sub-dimensions can be maintained in dimensions of the management in its management settings module), fill in the corresponding level 1 item, fill in the corresponding evaluation item, then click the save button and click the import details button. The system automatically matching and displaying the corresponding process review items details (the design details corresponding to the review items are maintained in the back-end) in the back-end, and then fill in the evaluation standard corresponding to the details design, and then click save button, click the import model and system will automatic display the evaluation standard and the review model (evaluation model are maintained in the back-end and review standards are unique). If the review standard has corresponding review model,

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system will display them. The model can be added if the review standard does not have corresponding review model. In the review form, one review dimension corresponds to multiple review sub-dimensions, one review sub-dimension corresponds to multiple first-level sub-items, and one first-level sub-item corresponds to one review item. Save the data first and then click start review button. If the data is not filled in completely and click start review, system will warn engineers that please complete the above data and then review. If the data is filled in completely and click start review, the automatic review will be conducted. The page details of the review form are shown in Figure 4:

The review report query module is displayed on the page with an independent menu. The index conditions of models, controllers and functions are displayed above the page. The export button on the left in the middle can export excel form according to the evaluation task export template style; The review task number, review task name, model, review category, controller, function, person in charge status information are displayed below. Details of the review task can be viewed in the operation column. The default page after the administrator logs in is the report query page. The details of the review report page are shown in Figure 5:

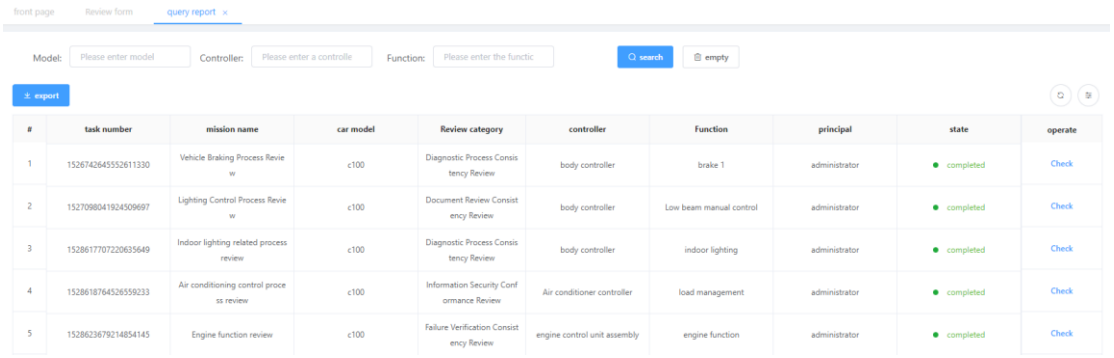

Figure 5: Review report page detail diagram.

The establishment of review model module and database management are maintained in the back-end, and the management setting module can maintain the sub-dimension management. At the top of the sub-dimension management page are the manufacturability and predictability tab page and sub-dimension index conditions of the review dimension. The new button on the left of the middle can add relevant sub-dimensions; Sub-dimensions data are displayed below, and sub-dimensions can be edited and deleted in the operation column. Details of sub-dimension management page are shown in Figure 6:

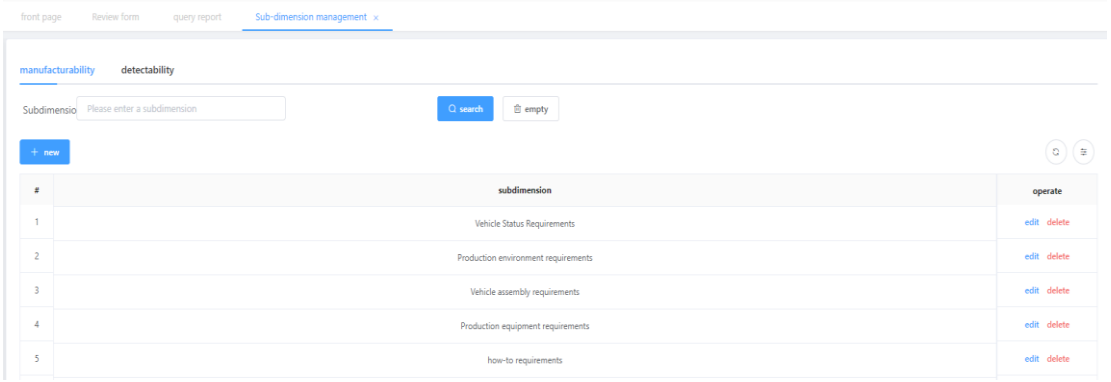

Figure 6: Detail diagram of sub-dimension management page.

The top of the review task management page in the management settings are the index conditions of the model, controller, function and person in charge; The task number, task name, model, review category, controller, function, person in charge and status are displayed below. Review tasks whose status is not started or completed can be deleted in the operation column. Details of review task page are shown in Figure 7:

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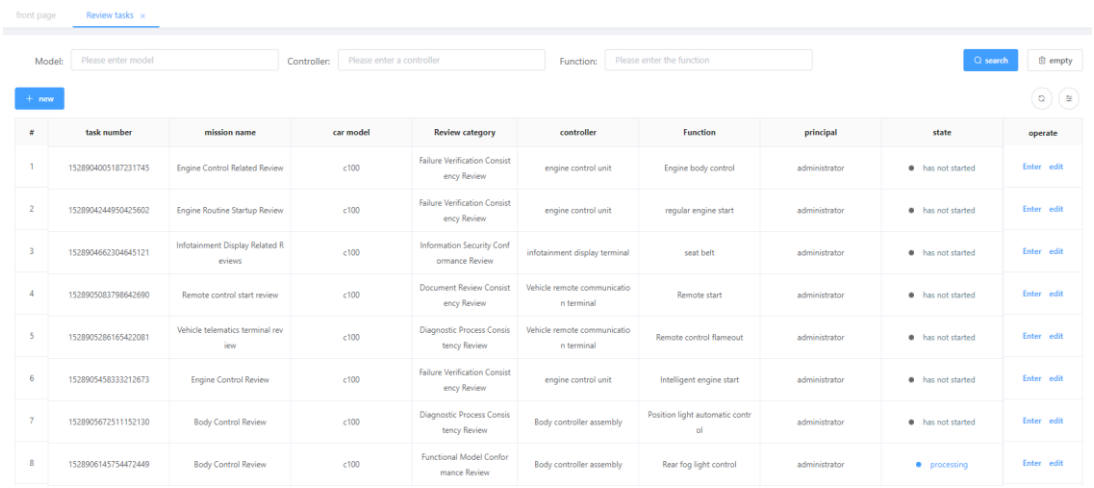

Figure 7: Review task Management page detail diagram.

The user name, responsibility, and object index conditions are displayed on the log management page. The user name, responsibility, object, operation content, and operation time are displayed below. Account management page: at the top of the account, name, responsibility index conditions; The new button in the left of the middle can pop up to add an account, fill in the account, name, email, and select responsibility. The account, name, and responsibility are mandatory. The account, name, responsibility (administrator and review engineer), email address, status (normal if enabled, locked if disabled), and creation time are displayed below. The operation column can be deleted, disabled/enabled, reset passwords, and change permissions. On the personal information page, the engineers can upload a user profile picture (JPG/PNG only, with a maximum size of 500KB), fill in the name, which is mandatory, and the responsibility is not operable when you add an account. Fill in the email address, submit personal information, and clear personal information by clicking the button. On the Change Password page, enter the old password, new password, and confirm password. The engineers can click the button to submit the password and clear the password.

6. Conclusions

In modern automobile enterprises, the parallel synchronous development mode has become the most preferred one, and the traditional serial synchronous development mode has been gradually replaced. Synchronous development of process review should exist in the early design phase of product, it is necessary to constantly improve and optimize the process review standards, which can prevent the generation of design defects [4]. The digital process of synchronous development process review under the parallel synchronous development mode makes the participants of the system really participate in it, and the way of automatic process review makes the process more optimized and streamlined. The optimized review process and clear personal responsibilities make the synchronous development process truly implemented, so that the digital process of synchronous development process review can be better promoted and applied.

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