Optimization design of electronic commerce system based on the basic principles of software engineering

Jin Lin
Minjiang University, Fuzhou, China
1371059506@qq.com

Abstract. Based on the basic principles of software engineering, this paper optimizes the design of e-commerce system from the aspects of demand analysis, system design, coding, implementation, testing and maintenance. Specifically, this paper adopts the object-oriented software development method, using the UML modeling tools to model the system, adopted the MVC architecture mode to realize the stratification of the system, using the front-end technology such as HTML, CSS, JavaScript to realize the user interface design of the system, combined with the back-end technology such as Java, JSP, the Servlet system. Through the system test and the use of code quality control tools, the system is accepted, and the maintenance of the system is planned and designed. Finally, this paper realizes an easy-to-use, stable, safe and efficient e-commerce system.

Keywords: software engineering; e-commerce; system design; system optimization.

1. Foreword

With the rapid development of the Internet and information technology, e-commerce has become one of the important branches in the business field. In recent years, with the popularity of online shopping, the demand for e-commerce systems is also increasing. At present, the design of e-commerce system has shown a trend of diversification, and some of the more popular design schemes include object-oriented programming, RESTful architecture, micro-service and so on. However, there are still some challenges in the design of e-commerce systems, such as user experience design, security, and performance issues. In the face of these challenges, we need to adopt some effective design strategies, such as using responsive design, introducing CDN network acceleration, and using HTTPS, to achieve a functional rich, easy-to-use, efficient and safe e-commerce system. At the same time, it is necessary to pay attention to the development and use of new technologies to meet the changing user needs and business scenarios.

2. Optimization design principle of e-commerce system

The basic principle of optimization design of e-commerce system is that on the basis of software engineering, we optimize the system demand analysis, system design, coding implementation, testing and maintenance, so as to realize the characteristics of the system function of rich, easy to use, efficient and safe. From the perspective of demand analysis, the needs of the e-commerce system should describe the needs of the users in as much detail and accurately as possible. User experience design needs to be introduced to optimize the user interaction experience, including page design, text layout, functional layout and other aspects of the design. In terms of system design, object-oriented ideas can be introduced using UML modeling tools, and the MVC architecture mode is adopted to layer the system and improve the maintainability and scalability of the system.

In terms of coding implementation, front-end technologies such as HTML, CSS, JavaScript are needed to realize the user interface design of the system, and business logic design such as Java, back-end technologies, JSP, Servlet to realize the system. Coding should follow the object-oriented principle, decompose the complex business logic into smaller modules, realize the reuse of code, and improve the readability and maintainability of the code. In terms of testing, the system needs to be fully tested, including black box test, white box test, performance test, safety test...
and so on. Code quality control tools, such as SonarQube, Coverity, can be used to help the tester find problems and hidden problems in the code, as well as improve the quality and stability of the code. In terms of maintenance, corresponding maintenance plans need to be formulated, including regular security inspection and repair, update version, software update, etc. At the same time, the log and monitoring of the system should be managed and maintained uniformly, so that the problems can be found and solved in time.

In addition, some effective design strategies need to be adopted to optimize the e-commerce system, such as introducing responsive design to meet the access needs of users on different devices; using CDN network to shorten the response time of the system, and using HTTPS protocol to guarantee the security of user information. In short, the principle of e-commerce system optimization design is based on the basic principle of software engineering, through requirements analysis, system design, coding, testing and maintenance optimization and improvement, improve the availability, reliability and security of the system, to meet the needs of users and the change of business scenarios.

3. Application of software engineering technology in e-commerce system and optimization

Software engineering technology is a very important part of e-commerce system optimization, because it provides a systematic and standardized development workflow. In the development process of software engineering, developers need to develop according to the various stages of the process, including: project planning, demand analysis, system design, coding implementation, test deployment, maintenance and upgrade, etc. Based on the software engineering technology, the electronic commerce system can be optimized, including the following aspects:

First, through demand analysis and planning, users' needs can be better understood, so as to provide a more accurate and complete description of the functions and features of the system. Demand analysis and planning are the premise of e-commerce system optimization, which can enable developers to better define the specifications and standards required for system design and coding implementation. Secondly, based on software engineering technology, object-oriented programming ideas and MVC architecture mode can be used to layer the system, so as to improve the maintainability and scalability of the system, and reduce errors and redundant code in the system development process[1]. In addition, software engineering technology also provides a series of testing tools and methods to achieve a comprehensive testing of e-commerce systems, including black box test, white box test, performance test, safety test, etc. These testing methods can help developers identify and fix the problems in the system, thus ensuring the stability and reliability of the system.

Finally, in terms of system deployment and maintenance, software engineering technology can provide a range of tools and methods, such as continuous integration, automated deployment, to ensure the reliability and efficiency of the deployment and maintenance of the system, as well as the maintainability of the system[2]. In short, software engineering technology is widely used in e-commerce system optimization, which can help developers realize the reliability, availability, maintainability and security of the system, so that the e-commerce system can better meet the needs of users and changes in business scenarios.

4. Optimization design scheme of electronic commerce system

With the rapid development of Internet technology and e-commerce, the e-commerce system is constantly updated and iterated, which requires developers to adopt scientific software engineering methods for development and management. Software engineering is a systematic approach whose purpose is to build and develop high-quality software systems. For the e-commerce system, the application of software engineering can improve its development efficiency and ensure the system
quality and stability. Therefore, we need to conduct a comprehensive analysis and planning from the aspects of requirements analysis, system design, coding implementation, testing and maintenance, and develop the appropriate development process and methods. Using the basic principles of software engineering to optimize the design of the e-commerce system can effectively improve the development efficiency, quality and stability of the system, meet the needs of users and continuously provide a better shopping experience.

4.1 Requirements analysis

In the optimization design of the e-commerce system, the user demand survey is a key link. Through questionnaire survey, interview, online interaction and other ways, the needs and shopping behavior of users, so as to provide basic data support for subsequent design and optimization. The demand analysis and planning stage is a detailed analysis and planning according to user needs and business needs, and a detailed description of the function, performance, interface and security of the system, so as to ensure that the developed system is in line with user needs and business needs. At the same time, the technical and development team required for the system also need to be properly planned[3]. In terms of interface design, the user interface design needs to be designed based on the user's shopping experience, ease of use and response ability. The interface design should follow the design specifications and color principles to improve the user experience, so that users are more willing to use the system.

4.2 System design

In the optimization design of the e-commerce system, the system framework design is a very important part. The MVC architecture mode can layer the system, making each level of the system independent and easy to maintain and expand. At the same time, it can also reduce the coupling degree of the system and improve the flexibility of the system. In the MVC architecture, the Model layer is mainly used to process business logic and data storage, the View layer is mainly used to display the user interface, and the Controller layer is mainly used to process user requests and data interaction. Therefore, in the system architecture design, it is necessary to put the corresponding part of the code into the corresponding level as far as possible, which is conducive to the management and optimization of the system. Database design is also an important aspect of the system design. In the e-commerce system, the database should be designed according to the business requirements and functional requirements. Including the table mapping of various business data, to determine the database type and version adopted by the system. In addition, it is necessary to consider the real-time and stability of the database in the operation process of the system, and support the high concurrency and big data of the system[4]. Therefore, in database design, we need to consider how to perform data database tables, read and write separation, and SQL optimization to further improve the concurrent processing capability and performance of the system.

4.3 Encoding implementation

The implementation of system front-end technology is a key point in the development of electronic commerce system. Using front-end technologies such as HTML, CSS and JavaScript can realize the user interface design of the system. In order to be compatible with access requirements on different devices, a responsive design needs to be combined to achieve the corresponding requirements. In this regard, in HTML and CSS, we need to design beautiful, concise and flexible web pages, while focusing on user interaction and feedback information. In terms of JavaScript, we need to write excellent scripts to realize the dynamic effect and response functions of web pages, and improve user experience and interaction. The realization of the back-end technology is another key point of the e-commerce system. Based on many back-end technologies such as Java, JSP and Servlet, etc., the realization of the business logic of the system is needed. These business logic includes commodity display, purchase, payment, logistics management and other functions. Here, we need to consider the implementation of business logic, reasonable data structure and design
mode, and pay attention to the maintainability and scalability of the code to improve the efficiency of subsequent development.

4.4 Testing and maintenance

Test strategy: The combination of gray box testing and integration testing strategy is adopted to verify the function, performance and stability of the system, so as to ensure the reliability and high availability of the system. Automated testing: the CI / CD integrated automated testing tools are adopted to ensure the requirements of system deployment and testing efficiency. Project quality monitoring: use SonarQube, Coverity and other tools for monitoring, in order to ensure the system quality, and early to find potential problems or hidden dangers. System maintenance: regular system security inspection and repair, update version, software update and other maintenance work. Log and monitoring management: the system log, monitoring and other information, in order to better track and solve problems. Scalability management: design a large number of expansion points, and use technical means to ensure the stability of the expansion function, and enhance the scalability of the system.

5. Conclusion

To sum up, the implementation of reasonable front-end technology, in-depth back-end technology and reasonable introduction of third-party components are the three indispensable aspects in the design of e-commerce system development. Only by optimizing and upgrading in these aspects can the system be optimized and improved and have a better user experience. In the implementation of the optimization design of e-commerce system, we need to fully consider the user needs and business requirements, using the software engineering technology and application of software engineering, from the demand analysis, system design, coding implementation, testing and maintenance design, in order to improve the availability, reliability and security of the system, meet the changing needs of users, to provide a better shopping experience.

Reference documentation