INFORMATION
TECHNOLOGY JOURNAL

Research on Management Model of Software Project Development

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Abstract: As software products are logic body and not physically visible, therefore difficult to measure and ensure quality. This study discusses the organization and management of software development with respect to development organizational structure, management model and quality control of software projects and comes up with project-based software companies' organizational structure, management model and software development quality control model.

Key words: Information system, software project, development management

INTRODUCTION

For high-tech companies dealing with information system development, the key to business development is technology and management. Especially along with the growing size of business, information system development management appears particularly important. Currently, software companies abroad have adopted ISO9000 or CMM as the standard for software development quality control and are moving towards Personal Software Process (PSP) and Team Software Process (TSP) (Gan, 2003; Zhang and Gan, 2003; Fan *et al.*, 2004). In light of the urgent, unique and uncertain nature of information system projects and the corporate culture and background, using ISO9001 quality management system standard, Capability Maturity Model (CMM) and the latest project management theory developed by International Project Management Association, the implementation of rigorous project process control and management with respect to project management organization, ongoing project communication and collaboration process and project management practice, implementation of science-based project process quality assurance measures through science-based setup of organizational structure and adoption and enhancement of process management, as well as establishment and refinement of science-based, comprehensive, documented project (and quality) management system can help effectively implement project process quality control and ensure satisfactory realization of customer needs.

This study discusses information system project development organization, management model and quality control issues.

ORGANIZATIONAL STRUCTURE AND MANAGEMENT OF INFORMATION SYSTEM PROJECT DEVELOPMENT

Organizational structure of information system project development: Information system project development management is a very important job, especially for large-sized information system project development, which are completed by multidisciplinary development team. Therefore, the success or failure of project planning, organization, coordination and management activities is closely connected with the efficiency and quality of development activities. Management is performed by organization and the core of management is people. As large-sized information system development projects require tremendous input of technical personnel, it is impossible to coordinate all departments without a well-established organizational structure and policy. The purpose of project management is to resolve problems and issues occurred in the process of project development, increase the development efficiency and allow the whole organization to work together in an orderly and organized manner (Yong, 2001).

Information system project development management is centered on information system projects and the project team performs project management and project activities as well. Therefore, information system project management generally employs a weak matrix, as shown in Fig. 1.

Project-based matrix-like organizational structure resolves problems that interdepartmental efforts are difficult to deal with. The project team established is the entity responsible for project management and all personnel on the project submit themselves completely to

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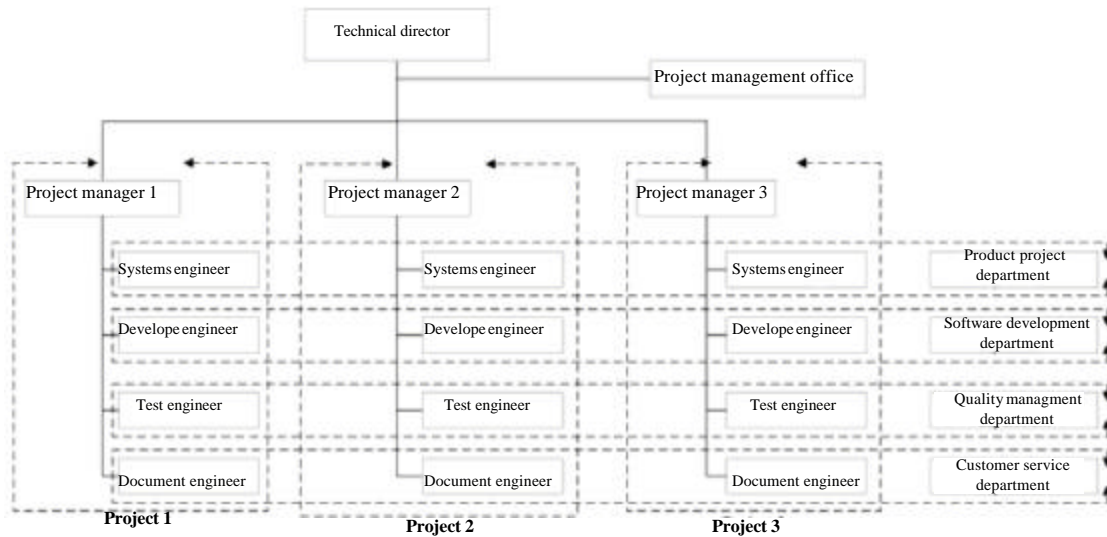
Fig. 1: Matrix organizational structure based on information system project

the leadership of the project manager. The project manager has decision making power with respect to staffing, technical plan and project plan in the process of project implementation. The project manager must possess the capabilities required to organize and manage the project. The organizational structure of information system project management comprises two parts, one established by function to take responsibility for technology realization and innovation and the other established to complete a particular information system project, i.e., project team. Such two-dimension organizational structure is a flexible organizational structure that is conducive to project management.

With respect to overall structure of management organization, the information system project management organization is built to comprise project director, project management office and project manager (and project team), under which the product department, development department and customer service department perform such supporting management functions as provision of technical personnel, technical training and administration surrounding the project objectives as the second-level management functions.

Organization is the object that performs management. For a project that involves a limited number of people, management can target each individual, while for a project involving a large number of people, management needs to be implemented at the organizational level. For the purpose of this study, different organizations can be established depending upon specific projects. One of the most essential organizations is program team, who is

responsible for program coding. A program team is the object that the project manager manages, while team members are the object that the team leader manages. It can be seen therefore that project management is almost impossible without a reasonable and stable organization.

Management is about problem resolution and absence of any problems in the process of project development means management is not necessary. The reality is exactly on the opposite side of coin, as there would be numerous problems in the process of project development, therefore management is not only tedious but also important. The most common activities include planning, scheduling and performance rating.

For information system project-based companies, it is advisable to use the organizational structure depicted in Fig. 2.

Division of responsibilities within the organization: In the aforesaid organization, each function has specific terms of reference. They complete respective duties, coordinating with each other to complete the software development and maintenance job.

Product project department: this department works under the direction of the software business division manager to research into and plan the technological direction of the software business division and the significant projects undertaken, as well as identify the project requirements, define the overall project architecture, develop overall implementation plan and establish the project development team.
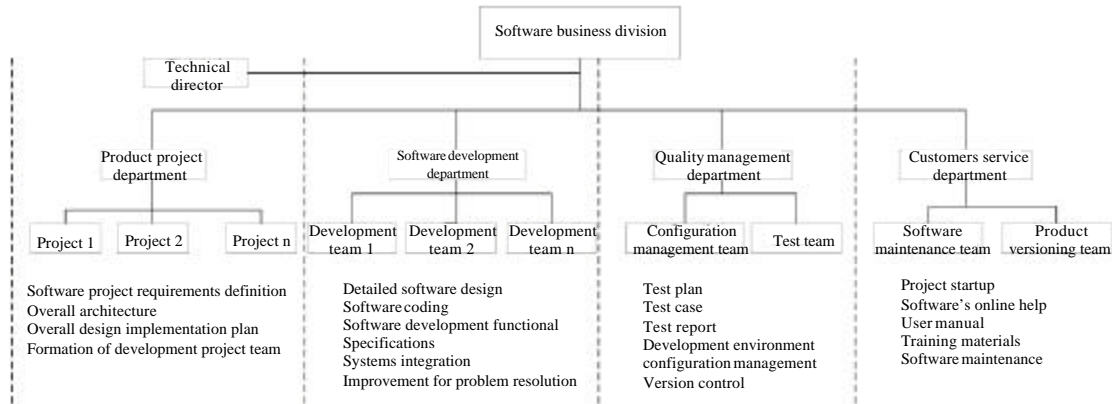
Fig. 2: Organizational structure of project development

Software development department: This department is the technical organization responsible for software development. Generally, in large companies, software development department is divided into several teams according to the software implementation technology (such as WEB team, C/S team and component team), whose main task is to complete the technology implementation involved in information system project development lifecycle.

QC department: QC department is mainly responsible for quality control of milestones against the software development and design specifications as well as management and test of software configuration in the software development process. Its mission is to identify any problems with software quality in the software development process and submit a possible solution to the project manager for problem resolution, ensuring the project design at the next phase meets the design specifications and realizing the end-to-end monitoring of software development process.

Customer service department: For information system project-based software companies, the quality of software products is the cornerstone of their survival and development. The blueprint of new projects and significant decisions concerning product development all need to be determined by the product management and customer service departments. Online help, user manual, training materials and post-implementation service activities are the responsibilities of this department.

Generally, the aforesaid functions should be well established, regardless of the size of business. Clear division of responsibilities is conducive to successful software development and quality assurance. Meanwhile,

it will be surely beneficial to cost control and risk reduction associated with software development.

APPROACH TO INFORMATION SYSTEM PROJECT DEVELOPMENT MANAGEMENT

The information system project development model has evolved from the original software development model, software engineering model and to internationally popular development model. The original software development model is very simple and its development ranges from understanding of user needs, coding, simple testing to release. The software quality depends upon the technical skills of individual programmers, therefore it can not be guaranteed and is very difficult to control. This model is suitable for small-sized projects with simple business process.

Software development management model under the guidance of software engineering theory also has certain problems, i.e., poor operability of particular processes, as mainly reflected by the process from requirement analysis to overall design. Requirement analysis is documented description, generally involving the understanding of software developers about user needs. Such description in most cases can hardly represent the future picture of software accurately and visually and users will find it very difficult to define their needs, making it highly difficult for users to determine the accuracy of requirement analysis. Since users have no idea what kind of system they want but know what kind of system is undesirable, the software engineering theory-guided model needs to be further improved.

In order to avoid the discrepancy problem with the process from requirement analysis to design in the software development process, the internationally
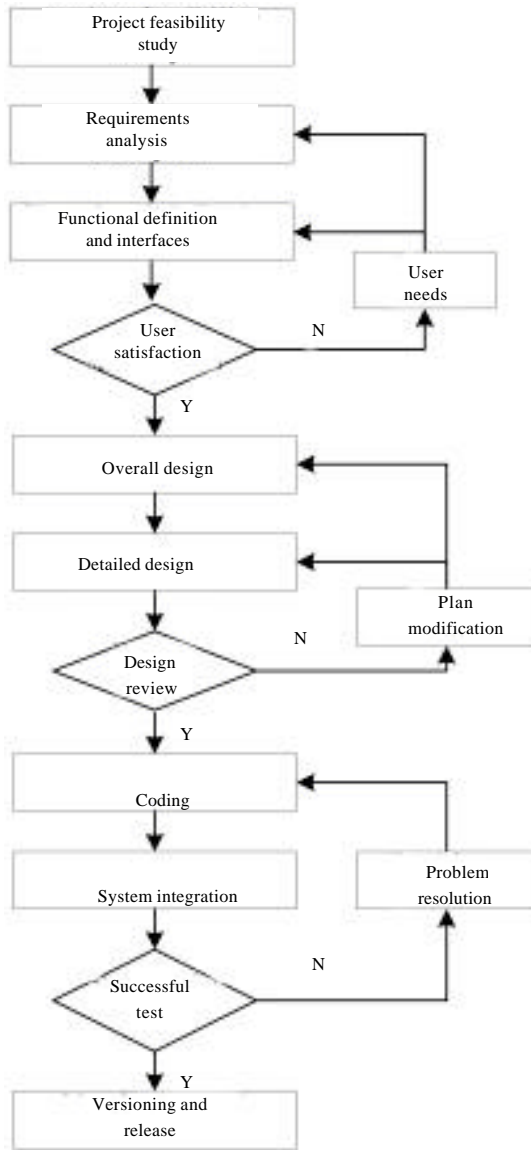
Fig. 3: Software development model

QUALITY MANAGEMENT OF SOFTWARE MANAGEMENT

Reinforcing process management and implementing rigorous process control: In the process of project implementation, each project is required to comply with the requirements of software quality management system and the development output at each phase needs to undergo rigorous review, including detailed functional description, system model, user interface design, software structure design, programming, unit test, integration test and system test (including functional test, performance test, interface test and regression test) before being installed and initially tested for users. The software development cycle completes after the trial operation and final test are successfully conducted. In addition to emphasis on technical review, rigorous in-process inspection and control of system operation is conducted using the combination of periodic inspection and random inspection to identify nonconformities with respect to system, implementation and effectiveness and take corrective and preventive measures immediately to prevent the reoccurrence of similar nonconformities. Meanwhile, the whole process of quality assurance system is examined using the principle of continuous improvement to keep track of the operation of quality assurance system and identify the main contributors to nonconformities, develop appropriate measures and policy, appoint the person responsible for correction and follow upon on the effectiveness of corrective measures in order to keep the nonconformities identified in the project implementation process always under closed-loop control. At the same time, SEPG collects feedback information about the system operation from the project team, constantly identifies and addresses the problems with the quality management system in the process of system operation in order to ensure the quality management system can be constantly improved.

Ensuring the customer's recognition of project progress through project quality control, communication and collaboration process: After the project is started, the project manager leads the project team to work with project stakeholders including the customer to develop the project plan, define the scope and objectives of project and divide the project into multiple phases including project startup, planning, requirement analysis, overall design, detailed design, coding, test and trial operation based on the Work Breakdown Structure (WBS). The assignments are then broken down to modules and responsibilities assigned to individuals to define the project schedule, quality plan, Software

prevalent software development model incorporates an additional process, i.e., functional specifications+user interface. This process not only helps resolve the difficulties in understanding requirement analysis for users but also resolve the problem of parallel activities of people in different roles in the software development process. It helps shorten the software development lifecycle and control the quality and cost of software development. The software development management model is shown in Fig. 3.

Configuration Management plan (SCMP), Software Quality Assurance Plan (SQAP), risk control plan and communication plan for a closed-loop project planning process with respect to schedule, quality, cost, configuration management and risk control. The implementation starts after the successful review by the QC team, management and customer representative. In the process of project implementation, the project manager organizes the project team members to implement the project according to the project plan using the project plan as the most important baseline in the project process control.

In the process of project implementation, the project manager focuses on the management of customer needs and implements project control by milestone according to the predefined project phases with respect to management of integration, scope, cost, time, communication, procurement, quality, human resources and risks. The project manager completes the project progress report on a weekly basis, communicates with key project stakeholders (customer and business executives) on project progress, cost and quality control and provides visual information.

"Customer perception of our services is the key to success of our activities". Therefore, in the process of project implementation, we keep focusing on meeting customer needs and have established a rigorous after-sales service processes including in-house technical support process, onsite technical support process, technical support process at user's site, user visit process and user satisfaction survey process, with a view to providing all-around, high-quality services and reflecting the customer-satisfaction spirit of ISO9001. At the initial stage of the project, sufficient communication with customers and a thorough baseline survey helps identify the customer needs and define the scope and objectives of the project together with the customer. In the system development process, we confirmed the project milestones with the customer based on the communication plan agreed upon by the customer to ensure the customer understands the status of system realization and optimize the system in time based on the customer feedback. In addition, we are deeply concerned about how well the customer is satisfied with our services by collecting and rating the customer satisfaction information via customer interview, telephone inquiry and customer satisfaction survey and by incorporating the installation, training service and after-sales service processes in the project implementation process. Based on the user feedback, we improved our services to ensure the quality of project deliverables are well received by the customer.
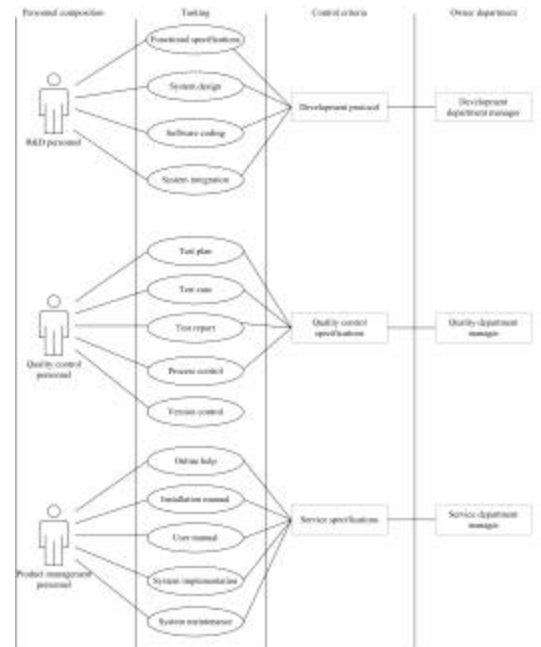

Fig. 4: Software development quality control

QC system: The purpose of definition of software development phases is to form a milestone-based software development quality control system. Each milestone is a quality checkpoint and these checkpoints run through the whole process of software development, thus forming a quality control system for software development. The objective of each software development phase is closely connected with quality control. Meanwhile, the software quality control specifies the role of software project team members in the project. Each specific milestone is connected with a particular role in the software development team and different roles are affiliated to different business functions, while the evaluation and management of personnel performance is the responsibility of respective business department. Therefore, milestone-based software quality control will surely evolve into role-based quality control in order to achieve real control of software quality. Role-based quality control model is shown in Fig. 4.

CONCLUSION

Since software products are logic entities, they are not physically visible and difficult to measure and ensure quality. This study discusses the organizational structure of information system development project, development management model of information system project and quality control and comes up with development

management organization for information system project-based companies, project-centered management model and software development quality control model. These models provides control and management of the whole process of software development at the four levels of product department, development department, quality control department and customer service department, thus achieving the purpose of rapid and resource-efficient software development.

ACKNOWLEDGMENTS

REFERENCES

Fan, J.Y., J.J. Zhang and R.C. Gan, 2004. Study of overall structure and implementation technology for business application integration. Telecommuni. Eng., Vol. 2004, No. 4.

Gan, R.C., 2003. Information System Analysis and Design. Higher Education Press, Beijing, China.

Yong, T.L., 2001. Successful Project Management. Betasma Publishing Company, China.

Zhang, J.J. and R.C. Gan, 2003. Direction and implementation technology of management. Inform. Syst. Comput. Appl. Res., 1: 7-9.