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Establishing Quality Assurance Function in System Development

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Introduction

The purpose of this study is to evaluate the pros and cons of a functional specialization approach to quality assurance versus having quality assurance functions embedded in the system development process. The study draws upon results from a case study of two system development projects in one of the largest retail corporations in the United States.

Literature Review

During the systems development life cycle, as pointed out by Yeh [1993], one should distinguish between the production and quality control processes. The software production process may adopt a particular development methodology. However, evaluating or reviewing a design is a separate process and requires a different approach. There seem to be two emerging trends in software quality assurance (SQA). One trend is to integrate SQA more closely with other quality assurance functions under a single director or vice president. Another trend is to differentiate SQA from system test and product assurance and to define it as a separate activity. Under this approach, SQA focuses on detecting defects in software development processes and intermediate products, and helping development organizations to employ the best current practices to improve the development environment. Mixed results have been reported on the impact of the structural characteristics of the SQA practices on the measurement and the improvement of software quality at the organizational level. However, the mechanism to establish a quality assurance function at the project level has not been explored in detail.

Methodology

The two projects studied were chosen based on their differences in size, business applications, development team structure, and the development methodology used so as to explore the difference in mechanisms to establish the quality assurance function in the development process.

Case One (SERVICE) was selected from the product and services division. It is large and complex and involves multiple subsystems, more than 100 databases, and has a large user base (16,000 service technicians).

Case Two (MARKETING) was an enhancement project to the assortment planning function in the marketing division. The system is used by over 100 marketing associates, all located at the company headquarter.

Data was collected through both semi-structured interviews with team members and project documents examination. Follow-up telephone calls were used to request additional information as well as to resolve inconsistencies.

Case Study Results

The data collected from the case study were analyzed in terms of project profile, user basis, team structure, quality assurance function, job description for developers, and user involvement as depicted in Table 1 (presented in Appendix A).

For project SERVICE, the importance of quality assurance (QA) was recognized from the beginning of the project. A QA function was set up and has been maintained over the years. It is positioned in the central support area for the division's IS function. A QA person, along with a backup individual, was assigned to each subsystem that went through the QA process. This individual would get involved early in the development process of the subsystem. His/her basic role was to ensure adherence to standards and guidelines, production of defect free code, and successful installation of the system for business operations. QA personnel attempted enforcing both walkthroughs and unit tests. However, such compliance depended significantly on the support and involvement of project leaders.

In addition, not all the subsystems in this project went through the QA function. Sometimes, it was perceived that going through the QA process consumed a lot of time, and that it might delay project completion. Therefore, the process was omitted.

QA personnel were supposed to participate in all walkthroughs. However, they normally were involved in walkthroughs for design and coding. This was primarily due to the lack of QA personnel and time constraints. Five full time employees constituted the QA team, and these

individuals were responsible for QA functions in about forty development teams. Quite often a QA person assigned to a project still carried responsibilities for the testing or implementation of a prior project. More emphasis was put on the completion and installation of the near finished system. The QA person caught in the middle of two projects did not have time to actively participate in requirements specification walkthroughs. This lack of involvement early in the development process imposed a learning curve later. As a result, documentation of problems or errors during requirements specifications was informal.

A short-staffed and overextended QA team, in part, was due to the negative perception of the QA function as a career path which led to few people being inclined to work in this area. Sometimes a lack of appreciation for quality assurance activities limited what the QA team could do. It was also hard for QA to take ownership of a system or get the recognition for the success of a system in terms of quality.

In project MARKETING, there was no formal QA group in this department. This was not to say that nobody was responsible for quality issues. In fact, the responsibility was distributed among all development team members and business partners, so everybody had responsibility in that regard.

A detailed list of responsibilities and measurement criteria for each project team member was provided in the Project Brief. Among the responsibilities, the need to improve the quality of the product and the process was explicitly stated. Various approaches to ensure this goal were stated among the responsibilities. This contributed significantly to this project being closely based on a standard methodology and various metrics were used in the development process. It also provided management with a means to monitor and control team member performance. Furthermore, it let team members evaluate their own achievements in terms of stated criteria.

There are a group of business partners (users) assigned to the project. During the development process, these business partners carried out a large amount of quality assurance activities. They would review all deliverables and documentation produced by the development team. They also actively participated in status meetings and walkthroughs. In addition, system acceptance tests were conducted by these business partners. Thus, they were directly in charge of recording program defects for system

acceptance test and then passing these data to the development team. Therefore, in a sense, these users performed the role of quality assurance function for the project to a great extent.

Discussion

The experience of the two projects studied shows that the presence of a quality assurance function facilitates the successful implementation of quality management paradigm. For example, in SERVICE project, the QA team posed as a checkpoint for the development process, and an on-line data set was established by the QA team to record any defects or problems found. Through these activities, the QA team helped to push the projects to perform more quality assurance activities and to collect more data on problems and defects.

On the other hand, in the MARKETING project, despite the lack of a formal QA function, various quality assurance activities were still performed. There were some developers implicitly assuming the responsibilities of quality assurance function in different development phases. These informal quality assurance functions performed implicitly through team members and business partners' activities also helped to facilitate the deployment of QA activities and metrics almost the same as a formal QA team. The underlying reason is that the responsibility for quality is distributed among development team members already through a formal inclusion in the job descriptions. Therefore a strong focus on quality was infused into the team members right from the beginning, and with quality issues clearly embedded in everyone's mind, every developer would act like a quality assurance person for his/her own work as well as tasks performed by others.

As Henderson and Lee [1992] suggest, both managerial and team member control in terms of behavior and outcome are important to improve the performance of a software development project. The presence of a formal quality assurance function can be viewed as a type of managerial control in terms of quality related activities and results. On the other hand, in MARKETING, team member control over their own behavior as well as the outcome of the development process was very high. And as shown by Henderson and Lee [1992], this type of team member control is most effective in outcome oriented projects. Since most system development efforts are evaluated in terms of system outcome, therefore, one could expect that the best way to achieve quality is to integrate quality related activities with every developer's other effort, and ensure it through team member control. Nevertheless, the presence of formal QA function as a managerial control would also be beneficial. But keep in mind that the formal structure of QA carries overhead, therefore, in a small project such MARKETING, it is desirable to integrate the QA responsibilities into normal development activities rather than having a separate person or team to carry out the function.

Conclusions

This study used a case study approach to explore the mechanisms to establish quality assurance function in a system development team. It is found that the presence of a formal quality assurance function facilitates the successful implementation of quality assurance activities, however, this approach carries large overhead, and requires significant change in people's perception towards quality assurance and the profession within the organization. On the other hand, integration of quality assurance responsibilities with normal system development activities facilitates team member control over quality issues, and therefore more effective in establishing quality assurance function within a project, especially when the project team only consists a small number of people.

Reference available upon request from the authors.

Appendix A