Extending the Notion of Software Quality in the CMM

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Abstract

The success --and sometimes the mere survival-- of some software organizations depends not only on the quality of their products, but also on the quality of the servicing and the marketing that goes along with them. Software process improvement should involve the entire software organization.

This paper describes a proposal to extend the CMM 1.1 to include two key software activities: software technical support and software product marketing. We introduce a proposal to include these areas at levels two and three of the model and describe how to do it. The issues discussed in this paper should interest software organizations who want to achieve software process improvement based on the CMM.

Keywords: Software Quality Assurance, CMM.

1. Introduction

The Software Engineering Institute's Capability Maturity Model (CMM) [PCCW95] [Your96] offers software organizations a good framework for implementing a software process improvement (SPI) plan. The eighteen key process areas (KPA's) described in it define a road map to incrementally enhance your software process. Additionally, the People CMM (P-CMM) addresses organizational and personnel issues related to software process improvement.

However, the CMM does not address key activities around the development process that are an integral part of some software organizations [Jenk95a],[Jenk95b].

Important aspects such as software product marketing and software customer support are not considered.

In certain business environments, it is critical for some software organizations implementing a CMM-based SPI project to consider those issues because they are critical success factors. The success --and sometimes the mere survival-- of some software organizations depends not only on the quality of their products, but also on the quality of the servicing and the marketing that goes along with them. Software process improvement should involve the entire software organization.

This paper describes a proposal to extend the CMM 1.1 to include two key software activities: software technical support and software product marketing. We introduce a proposal to include these areas at levels two and three of the model and describe how to do it. The issues discussed in this paper should interest software organizations who want to achieve software process improvement based on the CMM.

2. A Case Study

EXACTUS® PROGRAMMING is a small software organization specialized in developing management information systems (MIS) and image processing systems using graphical user interfaces and client/server object-oriented technology.

Its Development and Support Departments combined consist of a total of thirty six software engineers. The company is currently working on three different medium-size systems, totaling some half million lines of code. Maintenance and support services are provided for approximately eighty clients in four different countries.

The company's organization is shown in Figure 1. There are three main Departments, each one headed by a manager:

1. Sales & Marketing: is in charge of promoting the products and bringing new customers.
2. Research & Development: develops the software products and researches new software applications and development tools. The Development and SQA divisions are independent of each other and each one has a different Director.
3. Customer Support: provides the customers with technical support and training in the software products. It also provides some consulting services on an ad-hoc basis.

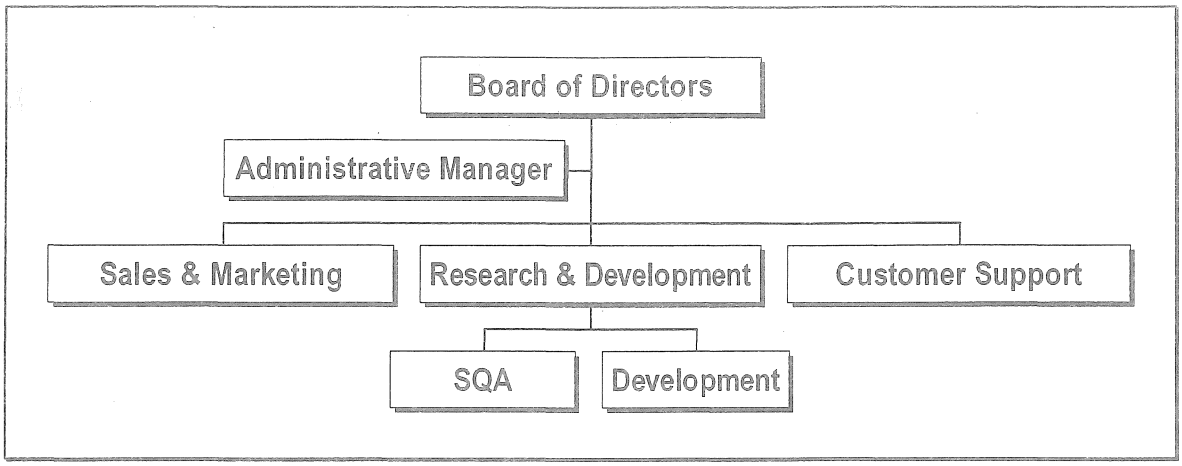

Figure 1. The organization structure.

We are currently implementing an SPI project with the goal of reaching CMM's level 2. To do that, we initially concentrated our efforts heavily on the following tasks:

1. Developing standards and procedures for project management and tracking.
2. Defining and documented the entire software process.
3. Implementing procedures to check the quality of the software elements produced through out the life cycle.
4. Developing our own customized standards for producing requirements and design specifications, performing unit testing, software maintenance, programming, and software configuration management.
5. Improving the software maintenance activities.
6. Establishing a software configuration management procedure.
7. Setting up an independent quality assurance division.

Up to date, we feel we have obtained some improvements in these areas. The organization is on the path of reaching CMM's level 2 within the next six months [Jenk96].

However, we observed that as soon as we improved in the areas mentioned above, the organization was hurting in others. In particular, we were having serious problems in the activities related to software customer support and software product marketing.

3. Extending the CMM

We realized that in order to achieve company-wide improvement we had to include these other areas not addressed in the CMM into our SPI project. For some software organizations like ours, adequate software customer support and software product marketing might be as important as good project management and configuration management.

Traditionally, these two areas have not been considered within the software engineering process, but rather as administrative tasks that support the organization's software process. However, if we want an organizational-wide notion of software quality, we have to seriously address them.

Hence, we propose to include software customer support and software product marketing in the CMM 1.1. The following two sub-sections describe a proposal on how to do it.

3.1 Software Customer Support

You have to support what you sell. In the final analysis, your organization's quality will be judged by your customers taking into account not only the quality of the product itself, but also the quality of the service that comes with it.

By service we mean software customer service, not software maintenance. We believe software maintenance, although not directly mentioned, is adequately addressed in the CMM. Software customer support and software maintenance are two activities highly related.

Some of the problems we were facing were:

1. Lack or coordination between Research & Development and the Support Departments.
2. Unsatisfied customers due to false expectations about the product's capabilities.
3. Late delivery of product enhancements promised to selected customers.
4. Inadequate support tasks planning and oversight.

We propose to create a new KPA at level two called Software Customer Support, as follows:

Software Customer Support

A key process area for Level 2: Repeatable

The purpose of Software Customer Support is to establish a framework that allows the organization to provide appropriate software technical support to its customers.

Software customer support encompasses establishing and maintaining an agreement with the customer on the support requirements, developing support plans and schedules, measuring the effectiveness and efficiency of support activities, receiving feedback from the customer, and reporting non-compliance problems to senior management.

A documented Plan for Software Customer Support is used as the basis for tracking the support activities, reporting status, and revising plans.

Goals

Goal 1:	Software customer support activities are planned and measured.
Goal 2:	Software distribution and installation activities are planned.
Goal 3:	Customer reported problems with the software are properly gathered and tracked.
Goal 4:	Software customer support people and the software engineering group maintain ongoing coordination.

Commitment to Perform

Commitment 1: The organization follows a written policy to provide technical support for its software products.

Such policy typically specifies the customer support conditions and terms, scope, levels of service, and related costs.

Ability to Perform

Ability 1: Adequate resources and funding are provided for performing the support activities.

The support people are assigned specific responsibilities for processing and tracking customer reported problems, and adequate tools are provided to do so.

Ability 2: Adequate communication channels are established with the customers.

Customer reported problems are reported through such channels in a pre-defined format. Examples of communication channels are: telephone, fax, mail, electronic mail, and other electronic means.

Ability 3: The support people receive training in the technical aspects of the software products.

Examples of training include: software functionality and performance, software installation, compatibility, and portability.

Activities to Perform

Activity 1: The software customer support plan is defined according to a documented procedure.

The plan must be defined as past of the overall project planning, and is reviewed by the affected groups.

Activity 1: The software customer support activities are performed in accordance with the customer support plan.

The plan must describe: mission and goals, general policies, organization, personnel profile, responsibilities and authority, resource requirements, work procedures, and audits and reviews to be conducted.

Activity 3: Customer reported problems are recorded, tracked, and feedback is provided.

Activity 4: Customers are profiled and key information is maintained.

The support people maintains key information on each customer and profiles are generated.

Activity 5: The status of the software configuration and support contract for each customer is recorded and maintain according to a documented procedure.

Activity 6: Customer training is performed on a needed basis.

See Training Program KPA (Level 3). Examples of training include: software usage, installation, and upgrade, and software problem reporting.

Measurement and Analysis

Measurement 1: Measurements are made and used to determine the quality of the support service.

The purpose is to measure the effectiveness and efficiency of the organization's software support activities. Examples of measurements include: backlog of pending customer reported problems, mean response time, and feedback from the customers.

Verifying Implementation

Verification 1: Activities for software customer support are reviewed with senior management on a periodic basis.

The purpose is to verify that the organization's software support policies are followed and to provide management with information about performance. A summary status report is prepared and distributed to the affected groups.

Verification 2: The software customer support activities are reviewed and/or audited and the results are reported.

The purpose is to verify that support procedures are followed and records are properly maintained, as well as to measure the efficiency of support activities.

3.2 Software Product Marketing

Software product marketing is not addressed in the CMM. However, in very competitive business environments, how you sell a software product might be as important as how you build it.

In our organization for example, the lack of a good marketing process was one the major causes of customer dissatisfaction. Some of the major problems we were facing are:

1. Inadequate training of Sales & Marketing people.
2. Lack of coordination of between Sales & Marketing and the other Departments.
3. Sales and marketing activities were badly planned and documented.
4. No customer satisfaction feedback was being generated.

Although traditionally marketing is considered an administration task, not an engineering one, we think software product marketing is an essential activity within the overall software process. Hence, we propose to add software product marketing as part of the software product engineering KPA at level 3, as follows:

Software Product Engineering

A key process area for Level 3: Defined

Goals

Add the following goal:

Goal 3:	The final software work products are appropriately marketed.

Commitment to Perform

Add the following commitment:

Commitment 2:	The organization follows a written policy for marketing its software products.

Ability to Perform

Add "software product marketing" to the sample software engineering tasks mentioned in ability 1.

Add the following ability:

Ability 5:	The marketing people receive training in the technical aspects of the software products.

Activities to Perform

Add the following activity:

Activity 11: The marketing plan is defined and executed according to the organization's business strategy and in coordination with the project's management.

Measurement and Analysis

Add the following measurement:

Measurement 3: Measurements are made and used to determine compliance of the final product's functionality and quality with the customer's expectations.

Verifying Implementation

Add the following verification:

Verification 4: Activities for software product marketing are reviewed with the project manager on a periodic and event-driven basis.

7. Conclusions

The CMM does not address all key activities around the development process that are an integral part of some software organizations. Important aspects such as software product marketing and software customer support are not considered.

Building quality software entails more than just development. There are some related activities besides development that are critical for an organization to be successful. Software customer support and software product marketing are two of them. Since the quality of a software product is judged by the customer taking into account these aspects, we think any CMM-based software quality assurance plan should address these issues as well.

The proposal described here incorporates software customer support and software product marketing into the CMM in a straightforward manner. We believe software customer support is an essential part of the overall software process. That is why it is incorporated as a new KPA al level 2. On the other hand, software product marketing can be added level 3 as one of the activities performed within the software product engineering KPA.

In EXACTUS® PROGRAMMING, our software process improvement plan is based on the extended notion of software quality proposed here. We have achieved significant organization-wide improvement using this framework [Jenk96],[Jenk97].

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