

Project Management Methodologies: Are They Sufficient To Develop Quality Software

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Abstract—this paper considers whether the use of a project management methodology PRINCE is sufficient to achieve quality information systems. Without the additional use of effort estimation methods and the user of measure that can predict and help control quality during system development. How to make sure the management of software quality to be effective is a critical issue that software development organizations have to face. Software quality management is a series of activities to direct and control the software quality, includes establishment of the quality policy and quality goals, quality planning, quality control, quality assurance and quality improvement. Professional bodies have paid more attention to software standards. Meanwhile, many countries are participating in significant consolidation and coordination effort.

Keywords *software project management ; quality control; PRINCE2*

I. INTRODUCTION

In the age of information, the information technologies are developing dramatically and colorfully. “Today IT is a major financial, operational, and organizational component of any strategy” (Mische, 2001, p.97). Information system has been widely applied worldwide. Thus software, as the core of IS, is becoming more and more important, and as a result, its function and scale is developing more complex and larger. How to ensure the quality of software to meet the requirement is a critical issue the software producers have to face. Software quality management is a vital factor in terms of controlling and monitoring software quality during the process of software development. In practice, a number of quality standards and process improvement standards have been drafted and put forward by different professional, international and national bodies. These standards can be used to help measuring the quality of software products and give an effective direction with regard to improvement of the software quality. In practice, a number of quality standards and process improvement standards have been proposed. These standards have spread rapidly and are now adopted by a large majority of the industrialized nations. And these standards and

methodologies do contribute effectively to software quality management. PRINCE is one of standards as one of successful project methodology, especially in the IT industry, this paper through analysis the software quality management to discuss whether only use PRINCE methodology is sufficient to achieve quality information systems, without the additional use of effort estimation methods and the user of measure that can predict and help control quality during system development.

II. SOFTWARE QUALITY MANAGEMENT

At first we have to know what is software quality and what is the quality management. “The totality of features and characteristics of a product or service that bear on its ability to satisfy stated or implied needs.” in the ISO 8402, the quality is be defined and Philip B. Crosby also give another definition of quality: Conformance to requirements. Sommerville (2001) indicated that standards and procedures are the basis of quality management. Software quality management should be separated from project management so that quality is not compromised by management responsibilities for project budget and schedule. An independent team should be responsible for quality management. BSI (2001) stated that the organisation should establish, document, implement and maintain a quality management system and continually improve its effectiveness in accordance with the requirements of widely accepted standard such as ISO 9000 series. “The adoption of a quality management system should be a strategic decision of an organization” (EN ISO 9001: 2000). Jiang et al. (2004) argued that a positive relationship between project success and software process management can be expected.

A. The Importance of Software Quality Management

Muller (2003) stated that research studies on IT projects continuously show large numbers of project failures, where projects are either abandoned before completion, did not meet their objectives, or were not accepted by the users. Yang (2001) pointed out that software programmers and

development teams rarely achieve their objectives for all of attributes which determine the quality of software, 75 percent of the software projects in the USA had quality problems; 60 percent experienced significant cost overruns. However, Ebert (1999) indicated that organization with well-managed software process improvement programs report several times productivity improvement, over 70% schedule reduction and up to 90% defect reduction. Yang (2001) also indicated that the survey shown that about 50% of activity rework costs can be salvaged by introducing a quality management system, such as is required by ISO 9000, and he got the conclusion that in order to ensure the success of software projects, the software developers needs a process-based management concept in terms of software quality and the software industry needs standards and frameworks. For most of the failed software development project, Jiang et al. (2004) argued that a lack of a well-established quality management framework is one of the main reasons to their failure. Macadam (2002) conclude that quality management is therefore of critical important in the software development process.

B. The Concept of Software Quality Management

Software quality is a kind of multi-dimensional concept, and it is difficult to measure and define. According to Ashrafi (2003) software development organizations have different strategies for improving their products quality, and no single method can be used in all situations. Sharp et al. (2004) argued that software quality management system is intended to make the process of software development visible to stakeholders such as customers, auditors and senior managers. To large extent, the software quality management system can make the process of software development measurable and auditable. Sommerville (2001) pointed out that software quality management simply involves defining procedures and criteria which should be used during software development and checking that these are followed by all engineers. Generally, effective quality management systems focus on three aspects, i.e. organization, resources, procedures. Gill (2005) pointed out that quality is built into software products through the management and technical prodedures. ISO 9001: 2000 (EN ISO 9001: 2000) takes a 'process approach' to quality management systems and presented as below:

- Plan: establish the objectives and processes.
- Do: implement the processes.
- Check: monitor and measure processes and product, and report the results.
- Act: take actions to continually improve process performance.

C. Quality Standard

Standards are generally defined in terms of a model of best practice, against which all others may be compared. Many quality standards have been proposed, and they can

be used to measure and control the quality of software products. Implementation of these standards can help software development organizations reaching its quality goals. Measure is important for software quality management activities as a measure provides a quantitative indication of the extent, amount, capacity etc. of attributes of a software product or development process. If you can not measure, you can not control. Software quality management can also be improved by implementing these quality standards in software development organizations. According to Gillies (1997) the software development organization employ the model established by standard for quality management system and then the accreditation body, e.g. BSI QA in the UK for the ISO9000 series, is called in to ensure that the implementation meets the required standard and indeed continues to meet the required standard over time. In turn, quality standards can be achieved by employing effective quality management system.

D. Measures of Software Quality

Measures of software quality are necessary in terms of controlling software product quality. If you can not measure the developed software system, you can not control its quality. Actually, measures of software quality provide developers, testers and users the criteria of evaluating software product quality. Many measures have been evolved to measure software quality and different measures may influence each other (see Figure 3) (ISO/IEC TR 9126-4, 2004). Some measures are discussed below.

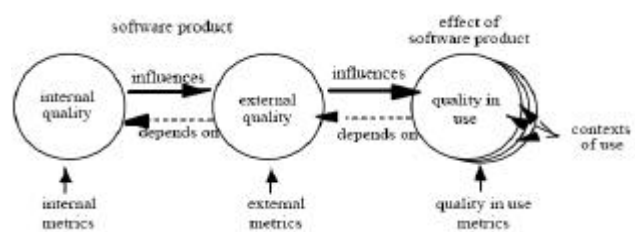


Figure 1: Relationship between metrics [Source: ISO/IEC TR 9126-4, 2004]

III. The Methodology of PRINCE

In this section I will discuss how to use the PRINCE project methodology to improve the quality of information system. Today the new version PRINCE 2 has already replaced the old version, so the PRINCE 2 is will appeared in the following section. We have briefly covered what structured project management, and hence PRINCE2, are all about. Now for some more details about the PRINCE2 method.

A. Coverage of PRINCE2

PRINCE2 says that a project should have an organised and controlled start, ie organise and plan things properly

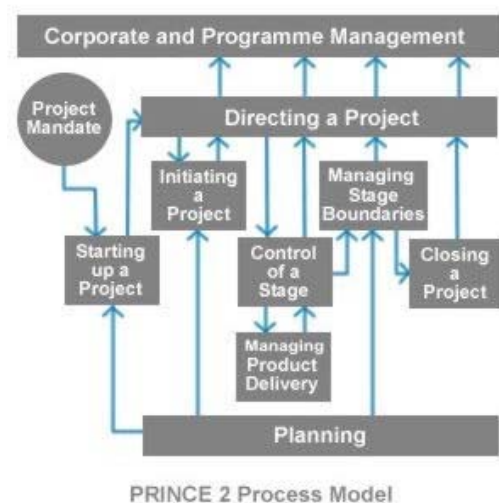
before leaping in; An organised and controlled middle, ie when the project has started, make sure it continues to be organised and controlled; An organised and controlled end, ie when you've got what you want and the project has finished, tidy up the loose ends.

In order to describe what a project should do when, PRINCE2 has a series of processes which cover all the activities needed on a project from starting up to closing down.

Organising and controlling a project means that we need to have someone responsible for doing the organising and controlling - this person is called the Project Manager. The Project Manager will select people to do the work on the project and will be responsible for making sure the work is done properly and on-time. The Project Manager draws up the Project Plans that describe what the project team will actually be doing and when they expect to finish.

B. *How to improve quality of software use the Methodology of PRINCE*

Within PRINCE, a project is defined as having: a defined and unique set of products, a corresponding set of activities to construct the products, appropriate resources to undertake the activities, a finite life-span, an organisational structure with defined responsibilities. In the whole Project, the aims of PRINCE is to deliver the required end-product(s), to meet the specified quality, to stay within budget, to deliver on schedule, and also project management must be built around: the products required by the client, the activities to produce the products, a method of planning which starts from the required products and incorporates the derived activities, a series of controls, based on the products which cover quality, schedule and cost, an organizational structure which defines the essential roles, responsibilities and lines of communication, interlinked with the other components. in the new version of PRINCE 2 the process model is



The Project management must be built around the following components:

- 1) *The products required by the customer*
- 2) *The activities to produce the products*
- 3) *A method of planning which starts from the required products and incorporates the derived activities*
- 4) *A series of controls - based on the products which cover quality*
- 5) *And project management must also be built around:*
- 6) *A schedule and costed approach*
- 7) *An organisational structure which defines the essential roles, responsibilities and lines of communication and which is interlinked with the other components*

In the Components of Prince have 3 divisions of management products, the first set division is Contracts, it including such as agreements, plans, approvals and reports. So many of them are about documents. The second set is about quality products, it have four main sectors.

- 1) *Policy*
- 2) *Procedures*
- 3) *Criteria*

C. *Product reviews*

The third set is technical products. It required by the end user and as defined in the Project Brief. Derived from the products defined. Those three components work together to allow Prince to meet project aims, The Prince provide Activities are derived from the products defined previously, Management activities including planning monitoring, reporting, contracts with outside parties etc. Quality activities, including testing, Quality reviews is to ensure that products (or part products) meet specifications. Technical activities that work needed to produce technical products. The activities below enable PRINCE to meet its aims because they provide a series of reporting product deliverables that are known to be fundamental to the project management; and a sequence of activities that are directly derived form the necessity to produce those products. Being a de facto standard and in the public domain, Prince has a huge user base and is widely supported through active and independent user groups. Its popularity may be due to its use in UK government IT projects, which are a shining beacon to the rest of the world and are never known to run over time or over budget.

D. *comparisons the prince with another Software Quality*

Software Quality Assurance is an umbrella activity that is applied at each step in the process of building the software. It is a planned and systematic set of activities necessary to provide adequate confidence that requirements are properly established and products conform to specified standards. The ISO9000 series of standards are the international standards defined for quality management systems. According to Gillies (1997), the ISO 9000 can be an extremely powerful incentive to organizations to get their

quality procedures right. Further, accreditation is powerful external evidence of this fact. Sommerville (2001) stated that ISO 9000 can be used in the development of a quality management system. According to BSI (2001) management review is the key element in the BS EN ISO 9001: 2000 model of quality management that keeps the quality management system responsive and fresh. Top management should review the quality management system of organization, and this review should evaluate both opportunities for improvement and necessary changes to the quality management system, which include the quality policy and quality goals. Therefore, by using ISO 9000 series standard the software development organizations can effectively improve their ability in software quality management. In order to ensure that the software will meet the requirements of a contract, purchase order or other agreement, Gill (2005) indicated that the ISO 9000 standard establishes requirements for software.

Compare the PRINCE, the standard of ISO 9000 have own feature in improvement the software quality, but the aim of project is same all of them is to meet the requirement of users, but different factors is that the quality of software only is a party of Prince, sometime for the balance of other factors such as investment reducing and technical hard to solve, the Prince will change his strategy to achieve the project

E. think about the other Team Factors

For any information system engineering, the team factors have a significant impact in the result, such as the language experience, the application experience, and the hardware experience of the team. Krishnan (1998) argued that higher levels of personnel capability on the software development team are significantly related with software quality. Higher levels of domain experience of the team are also related with a reduction in the number of field defects in the product. The quality of the software team is another key factor in determining quality in software products. The academic research indicates significant benefits from using small teams in software engineering. Carmel and Bird (1997) find that the common justification is not because a small team is so advantageous, but that a large team is disadvantageous.

IV CONCLUSION

As Quinn et al. stated no single model or theory can incorporate all the factors that influence major business decisions or all the possible combinations of these factors that could be faced". In the real world, the circumstance that organizations have to face is very complex; the factors that influence organization's strategic plan are also somniferous. no simple solution can be expected. So the Prince of project methodology do not solve the all of software problem of quality. However the lack of one best method doesn't imply

that all methods are equally useful for all organization. There is no best way of deriving a satisfactory strategic plan to manage the quality of information system. Although it is difficult to measure and control the quality of software and it is clear that it is impossible to measure the software quality by using a single number, it is possible to measure the main attributes of software that are the measurable properties of software and can characterize good quality of software. So, software quality can be characterized by certain measures: reliability, flexibility, robustness, comprehension, adaptability, modularity, complexity, portability, usability, reuse, efficiency... and all of them are possible to be measured. An indirect manner to ascertain the quality of software is to review the quality of the process producing it. Moreover many tools, techniques and strategies have been developed to control the quality of software. In order to ensure the high quality of software products, many approaches for quality assurance have been put forward. Therefore, we can conclude that the software quality can hopefully be measured and controlled by using proper methods, adopting correct strategies and following suitable standards. if anybody ask me again the project management Methodologies :PRINCE whether is sufficient to develop quality software, my answer is not always.

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