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Generic Ways to Improve SQA by Meta-Methodology for Developing Software Projects

Sonia Bhargava[1]
[1]M.Tech (SE)Student of Suresh Gyan Vihar University,Jaipur.
Under The Supervision of Dr.Bright Keswani[2]
Associate Professor & Head Department of Computer Applications, Suresh Gyan Vihar University,Jaipur.

Abstract

Any software organization can only get a respectable position in global market if they concentrate on quality. The scope of this research is to outline all procedures, techniques and tools to be used for quality assurance for developing small software project .Meta-Software Quality Assurance Program (SQAP) is an important factor to every software development process, Software Quality depends upon the customer satisfaction which can be achieved through applying SQA procedures. With the help of this research many critical issues of software quality are identified which can cause problems for software development & proposed solutions by meta-methodology for software quality assurance to cope with those problems in improving the software quality by management activities & software assurance team. We are proposing a methodology, which is flexible to incorporate new changes in the software industry and provides detailed guidelines and templates for real world implementation and customization.

Keywords: Meta Methodology, Project Management, SQAP, Software Assurance Team & templates.

I. INTRODUCTION

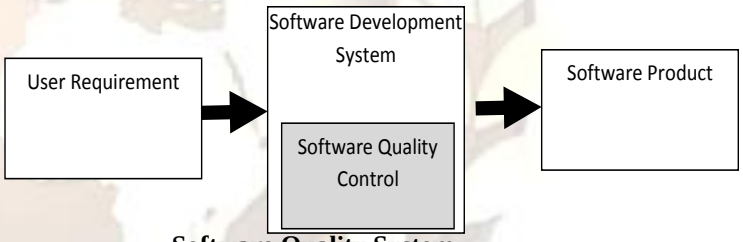
In this research we outlined software engineering approaches & discuss how software quality can be achieved or developing high quality software products through applying meta methodology. With the help of this research many critical issues of software quality are identified which can cause problems for software development & proposed new solutions to cope with those problems in improving the software quality by management activities & software assurance team.

Software Quality Assurance is found in almost every computer product that is developed today. Each software development company develops their own system of standards and procedures to follow using the IEEE ISO 9000 guidelines. They use this system to help improve the development of their software system as a whole, as reviews are made during and at the end of each step in the software development process.

In this research many issues related to software quality & responsibilities of management are identified. Management plays a huge role in SQA. So it is the prime responsibilities of the team managers to facilitate the team members & provide them the good working environment. There are many ways to improve the learning skills like they can go for some formal training courses. They should also take advantage of seminars arranged by the different experts to improve their learning skills.

The object should be Meta-SQAP is to produce quality control systems. A software project can be pictured as a kind of man-machine system into which user requirements are input & software products are output.

Software Development Process



Software Quality System

1.1 Software Engineering

Software Engineering is concerned with technical processes of software development, software project management, development of tools, methods & theories to support software production, getting results of the required quality within the schedule and budget by making compromises & adopting a systematic and organized approach.

1.2 System Development Life Cycle

A system development life cycle (SDLC) is a logical process by which systems analysts, software engineers, programmers, and end-users build information systems and computer applications to solve business problems and needs. It is sometimes called an application development life cycle. The SDLC usually incorporates the following general-purpose problem solving steps:
Planning - identify the scope and boundary of the problem, and plan the development strategy and goals.

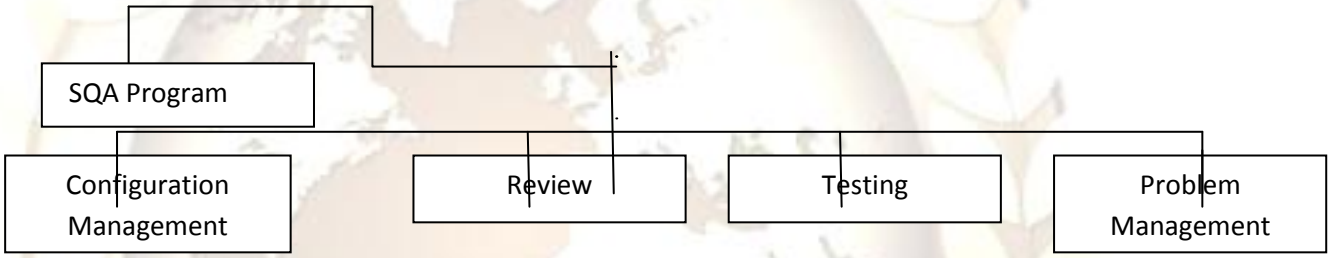
Analysis - study and analyze the problems, causes, and effects. Then, identify and analyze the requirements that must be fulfilled by *any* successful solution.
Design - if necessary, design the solution not all solutions require design.
Implementation - implement the solution.
Support - analyze the implemented solution, refine the design, and implement improvements to the solution. Different support situations can thread back into the previous steps.

1.3 Project SQA Activities

Project SQA is defined to be performed by the following 4 categories of activities in Meta-SQAP. Meta-SQAP provides an organization and procedures for projects SQA activities. The procedures are mainly defined by IEEE standards.

1. Review: - This category of activities includes design review, walk-through, code inspection and verification. Specification is reviewed by members of the project several times in each phase. Each software development phase is considered completed after verification.
2. Configuration management:- The main activities in this category are configuration identification and configuration control.
3. Testing:- This category of activities includes the development of well-planned documentation for testing, testing data development based on testing technologies and tools, and the analysis of test result, completing the test phase.
4. Problem management:- This category of activities includes difficulty report management, implementation of countermeasures for those difficulties, and testing to prevent the reoccurrence of difficulties.

Standard SQA Program



1.4 Software Quality Assurance

Software Quality Assurance is found in almost every computer product that is developed today. Each software development company develops their own system of standards and procedures to follow using the IEEE IS0 9000 guidelines. They use this system to help improve the development of their software system as a whole, as reviews are made during and at the end of each step in the software development process.
In this research many issues related to software quality & responsibilities of management are identified. Management plays a huge role in SQA. So it is the prime responsibilities of the team managers to facilitate the team members & provide them the good working environment. There are many ways to improve the learning skills like they can go for some formal training courses. They should also take advantage of seminars arranged by the different experts to improve their learning skills.

1.5 Importance of SQA

With improvements in technology, we have developed better approaches, tools & methodology to develop and maintain software. These changes reflect the increasing maturity of SQA field:

- The business of software development and maintenance has become increasingly competitive day by day which requires cost-effective and high quality products to compete in the market.
- Due to complexity of software applications failures can result in financial damage even the lives of human beings. Financial, air-traffic control, transportation, and medical applications demand high-quality software.
- Due to change of customers and users attitude toward quality. Customers are more willing for get better quality and higher productivity software.

1.6 Meta –SQAP

Meta –SQAP was developed as a meta-methodolgy which solves the difficulties regarding the development & operation of SQA programs so that SQA activities can be effectively & systematically executed in software projects. The SQAP is effectively operated by the SQA management cycle activities, consisting of SQA goal definition, SQA program development, SQA program operation, SQA program evaluation and feedback. Meta-SQAP provides the methods, tools & techniques for developing good quality software.

It facilitates the design & operation of the best possible quality control system for a software project. Meta-SQAP also provides a guideline for implementing or tailoring the standards to various projects. Adequate time & employee, resources are allocated for SQA activities & SQA management effectively which entail the development of software.

II. Problem formulation(need & significance of research work)

The goal of the study is the development of organic projects by improving the quality of a software .With the help of this research many critical issues of software quality are identified which can cause problems for software development & proposed new solutions to cope with those problems in improving the software quality by management & software assurance team. So here problem is to:

- Identify the goals of a software project.
- Lack in domain knowledge.
- Lack of skilled professionals.
- Develop & put into practice an SQA program which is optimal for the organic projects.
- Adequate knowledge of software technology.
- Required time & effort for planning & managing.
- Identify the responsibility of management activities.
- Verify and revise quality assurance standards as needed.

Resolving Issues

With the help of our research different procedures & standards can be applied to improve SQA. The main objective should be to develop & put into practice an SQA program which is optimal for the project. Product evaluation and process monitoring are the SQA activities that assure the software development and control processes. Described in the project's management plan are correctly carried out and that the project's procedures and standards are followed. If the guidelines are implemented properly to solve time, budget, resources, skilled professionals & environmental factors are very much helpful to any software organization. The steps to improve quality are:

- Identify goals of a software Quality.
- Identify areas to improve.
- Improve software developers skills.
- Improve domain knowledge.
- Proper planning & management related to time, budget & resources.
- Review & revise quality assurance standards.

III. Objectives

Accordingly the main objectives of this research are:

- **Identify goals of the SQAP:** The main objective of SQAP to develop & put into practice an SQA program which is optimal for the project.
- **Critical issues of the SQA software:** Identify the goals of a software project, lack in domain knowledge, and lack of skilled professionals, develop & put into practice an SQA program which is optimal for the organic projects, adequate knowledge of software technology, required time & effort for planning & managing.
- **Identify the responsibility of management activities**. Product evaluation and process monitoring are the SQA activities that assure the software development and control processes. Described in the project's management plan are correctly carried out and that the project's procedures and standards are followed.
- **Improving the software Quality by Management Activities:** SQA management activities manage an SQA program which defines the procedures & data for the project SQA activities. Activities involved SQA goal definition, SQA program development , SQA program operation, SQA program evaluation & feedback.
- **Project SQA Activities:** The project SQA activities are defined as review, configuration management, testing & difficulty management**.**
- **Verify and revise quality assurance standards as needed**: Verify & revise quality control process as needed is a part of most successful business ventures. Maintaining high quality control standards can help improve company reputation and make the workplace safer and more pleasant for employees
- **Improving the software Quality by software Audit:**
  IEEE Std. 1028 offers a list of 32 "examples of software products subject to audit", including documentary products such as various sorts of plan, contracts, specifications, designs, procedures, standards, and reports, but also non-documentary products such as data, test data, and deliverable media.
- **SQA Methodology:** SQA consists of methodologies and techniques of assessing the software development processes and methods, tools, and technologies used to ensure the quality of the developed software.

SQA is typically achieved through the use of well-defined standard practices, including tools and processes, for quality control to ensure the integrity and reliability of software. This special issue serves as a platform for researchers and practitioners to present theory, results, experience, and other advances in SQA.

IV. Methodology

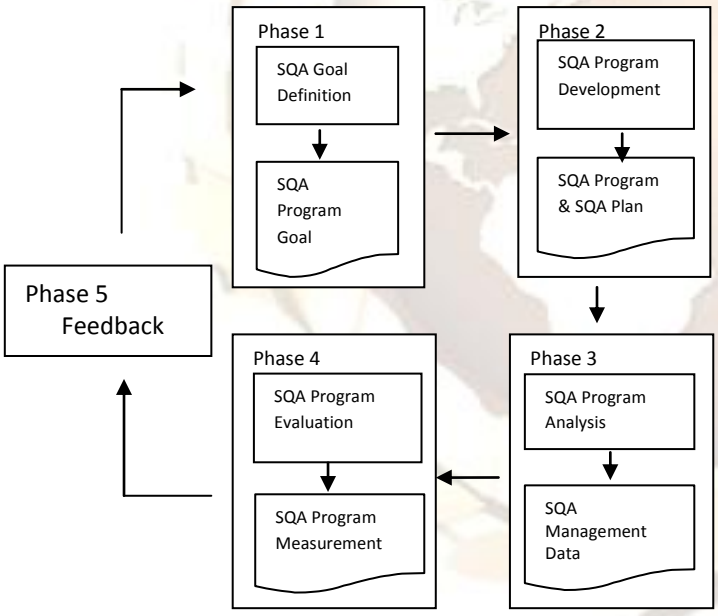
It is necessary to establish processes, procedures, techiniques, tools and clear methodologies to reduce complexity of software. Doing so will ensure that the end-product has been exposed to intensive and rigorous industry-wide testing techniques and procedures. This will translate into a high degree of assurance that a software system passes the test for correctness and reliability. Meta –SQAP was developed as a meta-methodology which solves the difficulties regarding the development & operation of SQA programs so that SQA activities can be effectively & systematically executed in software projects. The SQAP is effectively operated by the SQA management cycle activities, consisting of SQA goal definition, SQA program development, SQA program operation, SQA program evaluation and feedback.

A true methodology should encompass the entire system's development life cycle. Most modern methodologies incorporate the use of several development tools and techniques. A meta-methodology for software quality assurance has been developed and put into practice so that software quality assurance activities can be effectively and systematically executed in software projects. Meta-SQAP (software quality assurance program) provides guidelines and information concerning the three levels of SQA activities: the project SQA, the SQA management cycle, and the division SQA activity levels. Under Meta-SQAP, project SQA activities, such as review, configuration control, and testing, are well organized and planned out as a SQAP. The SQAP is effectively operated by the SQA management cycle activities, consisting of SQA goal definition, SQA program evaluation, and feedback. All the projects are supported by the division SQA activities in each division, such as organizational restructuring and information exchange between projects.

- SQA Goal Definition: Internal (skills & experience of the project staff) & external (scalability of a system, user requirements etc) factors should be considered in setting SQA goal. There are two types of quantitative goals are established. First one is activity quality and the second is product quality.
  1. Activity Quality: - SQA activities should be involved as the basis for SQA goal definition. These activities are evaluated according to goals of SQA.
  2. Product Quality:- Goals about product quality are set as the basis for analyzing the results of SQA activities.
- SQA Program Development: The SQA program developed in this phase is designed to accomplish the goals which were set in the previous phase through planning, designing, & coordinating. The SQA program development is having three steps:
  1. Planning: Planning includes defining what criteria are quantifiable in terms of indirect measures, how these indirect measures can be used for prediction & control, when & how the data needed for computing all measures should be collected and methods & tools should be used. Selecting appropriate indirect measures requires that we have knowledge of the project's particular development or maintenance process.
  2. Designing: In designing the SQA activities operation rules & management rules are defined. For this we need appropriate rules, procedures ,technologies and tools are considered for developing software projects.
  3. Coordinating: The SQA program is checked as to whether operation is possible or not on the basis of: allocation of man-hour & coordination with users & external sources.
- SQA Program Analysis: SQA activities are executed according to the detailed plan & SQA program is reviewed & modified at of development phases. During & after the project we must conduct data analysis. The information should be disseminated to the responsible organization. The operational definitions of quality provide traceability from goals to metrics and back. This lets you interpret the measurement in context, ensuring a focused, simpler analysis. The goal driven operational measures provide a framework for the kind of analysis we need.
- SQA Program Evaluation & Measurement: The SQA programs are evaluated in this phase, the result of the evaluation is recorded & reported as feedback for future projects. This phase includes two activities 1) measurement, in which the methods and techniques specified during the planning phase are applied to gather the actual values for all defined direct & indirect measures & distributions and 2) Evaluation: In which direct measures are compared to the quality requirements & indirect measurements are interpreted to explain or predict the values of

direct measures. Evaluation also involves deciding if the requirements were met for each quality characteristics & for each quality characteristics and for entire set of project requirements.

- Feedback: If the results of evaluation for an SQA program were good, the feedback data is referred to during the development of a new SQA program. The results of the analysis & the interpretation phase can be feed back to the organization to change the way it does business based on explicitly determined successes & failures. For example, understanding that we let faults of omission pass through the inspection process and be caught in system test provides information on how to modify the inspection process. Quantitative histories can improve that process. In this way experience is propagated throughout the organization .We can learn how to improve quality & productivity & how to improve definition & assessment of goals. This step involves organizing the encoded knowledge into an information to help improve planning, organizing ,development and assessment



V. Implementation & Guide

Based on previous experiences we are trying to evaluate & improve the quality in several organizations by SQA guidebook. Meta –SQAP has been explained to software project leaders & managers as a part of SQM (Software Quality Measurement) education program using the guidebook.

5.1 Meta-SQAP guidebook

We need SQA methodology manuals for developing good quality software projects put Meta-SQAP into action. This manual explains the meaning of Meta SQAP & how to put into operation the software project. The benefits of the standard SQA program are:

1. Project SQA activities well planned & be standardized among projects & division through the Meta-SQAP manuals.
2. Project SQA activities accurately performed because of planned operational activities.
3. SQA program can be improved by repeating 5 phases of SQA activities. These are SQA goal definition, SQA program development, SQA program analysis, SQA program evaluation & feedback.

5.2 Division of the standard SQA program

Project SQA is defined to be performed by the following 4 categories of activities in Meta-SQAP. Meta-SQAP provides an organization and procedures for projects SQA activities. The procedures are mainly defined by IEEE standards.

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4. Problem management:- This category of activities includes difficulty report management, implementation of countermeasures for those difficulties, and testing to prevent the reoccurrence of difficulties.

This feature facilitates customization of the standard SQA program**.**

5.3 Practical use of Meta-SQAP

All SQA activities are defined in this SQAP manual which gives right direction to staff members. When a goal is defined at the beginning ,guidelines for the project SQA activities are available. Every positive result of the SQA activities incorporated into standard SQA program when project is based on Meta-SQAP. The improved division standard SQA program then becomes the new basis for all other activities in project. This

manual very much helpful to manage the SQA program including report documents, monitoring & development of division standard SQA programs. It encourages the use of Meta-SQAP by distributing manuals & providing instruction for managers & project heads.

VI. Detail of Research work

In this research, we have tried to proposed some new ideas to support Quality Assurance by M-SQAP, management activities & software assurance team. On the basis of analysis are provided which can help software organization to improve the quality of their software products. The goal of the study is the development of small projects by improving the quality of a software .With the help of this research many critical issues of software quality are identified which can cause problems for software development.

Meta –SQAP was developed as a meta-methodology which solves the difficulties regarding the development & operation of SQA programs so that SQA activities can be effectively & systematically executed in software projects. The SQAP is effectively operated by the SQA management cycle activities, consisting of SQA goal definition, SQA program development, SQA program operation, SQA program evaluation and feedback. The SQA methodology that is developed should continue to improve .The concept of Meta methodology should be applied for project management including schedule control & cost management.

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