RESEARCH ARTICLE OPEN ACCESS

A Glimpse of Software Quality Assurance and Factors Affecting It

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ABSTRACT
Quality is an important factor in software industry. Software quality depends upon the customer satisfaction which can be achieved through applying standards. In this era achieving quality software is very important because of the high customer demands. This paper identifies reviews, addresses the factors affecting the quality of software in long run and indirectly suggests improvement for achieving it and addresses the problems for lacking interest in improving the software quality by higher authorities and software assurance team.

Keywords:- Software Quality Assurance Process, Software Quality control, Software as End Product

I. INTRODUCTION

Software Quality Assurance is a "planned and systematic pattern of all actions necessary to provide adequate confidence that an item or product conforms to established technical requirements" [1]. A set of activities designed to evaluate the process by which the products are developed or manufactured. The main role of SQA (software quality assurance) is to maintain the quality of the software products [2]. For that it is to make sure that the standards and procedures are properly followed. Software QualityAssurance [3] standards are developed to help organizations to achieve quality products [3]. Standards are the set of guidelines which help to achieve best results.

The standards and procedures include CMMI and ISO but it is difficult and costly for small SoftwareDevelopment Organizations to follow the standards.

A company has to produce very high quality products to achieve a respectable position in global market. In this era of globalization things are changing and moving with great pace. To survive in this world of global competition needs efforts, money, people and time. Time is very precious and one cannot go back to find mistakes and errors committed during the process as it involves cost, time and resources. What ever is done should be consider as first and last time. To avoid such problem the organization should come up with major factors influencing the quality of process and the product. There have been many incidences of failure in real time software system which led to serious consequences. The main role of SQAP (software quality assurance process) is to maintain the quality of the software products. SQAP is very important as it builds quality into the products.

Quality assurance under Open source development deals with larger development community and security issues [4]. Delivery of high quality products and services is for increasing customer satisfaction is the need of open source development [5]. SQCP is the process for controlling and monitoring the quality of the software. All this

results are added into a standard product with high level of quality. In this, rest of the paper is structured as follows. Section II deal with short Literature Survey, Section III deals with Models relating to Software Quality and Section IV has listing of all factor affecting software quality assurance, Section V Conclusion

II. LITERATURE SURVEY

Quality plan is the most important in any quality improvement activity, SQA team managers are responsible and accountable to develop quality plan and also implement the plan. They are also responsible for quality measurement, quality improvement and configuration management.

Quality Plan includes the inspection of the problems. Inspection for finding the problems while maintaining the quality was explained by the Parnas [6]. The methodology used for inspection was dividing and conquer. It was time consuming task, but ensures problems detection. No training was required for the Testing Team or Software Engineers.

Some authors have suggested techniques like Inspection [7], Peer Reviews [8] useful for all phases of software development. Review of documents and artifacts, design documents, coding documents are important for quality control activities. Inspection is quite useful for assuring quality in software development. Inspection helps for detecting and removing the errors. Revision is sort of revising work in all phase. Revision builds confidence in the process. Some authors have classified factors according to the influences. Some have classified them on basis of software development phases.

III. MODELS RELATING TO SOFTWARE QUALITY ASSURANCE

3.1 PARNAS MODEL

Parnas[6] explained the role of inspection in reducing quality problems in SQA. First of all he explained the need of inspection in SQA to reduce the problems, how it helps to find errors in the software. The main methodologies behind the inspection activity are dividing and conquer.

The research also shows that inspection is a time consuming process but it ensures to find errors in the process.

Many benefits are the findings of this research. he explained that there is no formal need for the training of inspection. A software engineer does not necessarily need a certification for the inspection. As inspection does need a proper training so there is no need for a company to invest on it. So it will give many benefits despite consuming too much resources of a company. The key benefit of the inspection is to benefit errors in the code but it can also help to find many ambiguities in the development phase like it can easily reveal that proper guidelines are followed or not like commenting etc. it is not necessary to do inspection at the end of the project but it can be done at any phase of the project and reveal the errors from the code.

3.2 DAVID MODEL

David [9] explained in their research about the free software quality and factors affecting them. He explained that the quality of the free software is higher than the other projects. Many reasons behind the improved quality are explained in this research and some comparisons are done between free projects and other projects. The quality of this free software is high because of the open development models used in the development process.

3.3 PEER REVIEWS MODEL

Peer reviews plays very important role to improve the quality [10] of these projects, user involvement is also very important for the feedback and on the basis of this feedback software quality can be improved very easily. User gives their feedback on the basis of their experience and this feedback can help to improve the quality of the software.

IV. FACTORS AFFECTING QUALITY ASSURANCE PROCESS

The factors have to be identified which will optimize the software development activities and bring profit to the industry. It is human centric process and involves time. Process maturity level predicts the quality of software and other aspects. Identifying of requirements and finalizing them is time consuming process. The software development should be dynamic and not mechanical activity and hence factors should be identified. Moreover the relationship between various factors should be identified. The process adopted for developing software needs to take into account these factors. Mapping is required between various factors to optimize the process of software quality.

The journey of software development can be divided into following major phases which are Quality Assurance Process SQAP i.e. Input, Quality Control Process SQCP i.e. Measure & Software as end product SAEP i.e. Output.

4.1 SQAP - Software Quality Assurance Process

SQAP is the process involving various activities of software development. It involves building quality into the product through four main phases which are requirements gathering, converting requirement into design phases, implementing the product developed, maintaining the product. There are four main developmental approaches i.e. structured, object oriented, component base and web based development [6]. For any process the goal has to be defined. SQAP determines whether everything is going according to polices standards and procedures. QA is about providing assurance and credibility the product should work right and people should believe that it will work right. It is an expensive time consuming process. It touches all aspect of project. It pushes the product outdoor. SQA is the responsibility of separate independent group and has authority of redevelopment and retesting when needed. It is involved in improvement of process and product. It works like the process police. Thus it is a preventive approach and prevents faults from occurring by providing rules and methods. It prevents defects from occurring. It establishes process.

There are many factor associated with activities which influences the quality assurance process. Some of them are listed as:

- Planning (objective, review plan, appraisal plan)

Any activity associated with SQA has to be planned and should be with objectives. The plan has been reviewed, approved with concerned person.

- Standards (code, design)

Standards are the set of guidelines which help to achieve best results. The standards include CMMI and ISO but it is difficult and costly for small Software Development Organizations to follow the standards.

- Rules
- Legal Procedure

Procedure should be made legal so that they are followed properly. They are developed to help organizations to achieve quality products.

- Documentation (of Process & Product)

Any legal activity which is going on should be documented.

- Guidelines

There should be guidelines for every activity which are taking place under SQAP.

- Responsibility

For every activity which is being carried there should be responsible person.

- Technology

- Right Conduct
- Authority
- Approvals
- Environment
- Culture [11],[12]

Culture difference among software developers, project managers, and executive managers were the main reason in Thailand for not implementing software process models and improvements.

- Risk
- Size [13]
- Report
- Reuse [14] (code and design)
- Virtue & Ethics [15]

Poor quality of software presents an ethical issue for society. Quality in recent times is extremely poor causing significant monetary and social problems. Quality problems are also affecting our national security. E.g. National security plan is required to protect the cyberspace. Some other factors are listed here with. There are many innumerable sub factor/aspect on which a factor depends.

- Cost involved
- Efforts (Manpower i.e. developers, tester, others)
- Practice [16]
- Schedule
- Schedule Pressure
- Approaches
- Techniques (Customization)
- Feedback/Customer satisfaction
- Output of each phase entering into other phases
- Tools

- Time limit (deadlines)
- Revision (all phase, design, code review, technical review, walkthrough)
- Checklist
- Manuals
- Inspection (code inspection)

Fagan and Gibbs have suggested on code inspection

- Defects (low, high, medium severity)
- Certification (quality attributes, process, level of that attribute)
- Management (Co-ordination & Team Communication)
- Result Oriented
- Budget Pressure
- Resources
- Process Metrics

Key activities are identified, controlled, monitored and measured by metrics [7]. Key parameters are identified and variations are measured. Corrective actions can be taken in case of deviation.

- Information Diversity [14]
- Task conflict [14]
- Learning [14]
- Project Management
- Methodologies[8]
- Cycle Time (speed of process)
- Complexity (process, code)

The Software complexity has a deep relationship with constraints, testing, quality, development and productivity [4].

- Process Maturity
- Security (in open source development)

All above factors are being listed from papers (journals, conference) listed in reference. These entire factors have impact on the quality of the software. These factors are in some way influencing the quality assurance process thereby building, accumulating quality drop by drop into software. Many times it is seen that these factors if not taken care starts eroding the quality from software. So all the factors has to be taken care of in some or other way.

V. CONCLUSION

SQA plays a very important role in business of Software Company because the only factor which results in getting consistent projects from permanent customers is customer satisfaction

Software Quality is dependent on many listed factor. It is very important to list all factors to optimize the process of software development. Identification of all these factors depends on availability of number of research paper. Improving quality leads to decreasing rework, cost, and schedules. This leads to improved capability which in turn lowers prices and larger market shares. All this causes increased profits and business continuity.

One of the major problems with software development organization of low and medium process maturity is that the priority is always to maintain the stability of the organization. Such organization cannot afford to invest more money in process improvement as their future is unpredictable. Our future work is to develop a model on software quality assurance. The relationship can be established among these factors.

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