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Defect Handling In Software Metrics

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ABSTRACT: Defect Handling is one of the major and important activity involved in the software various software projects. Defect Handling basically includes identification and taking actions for defect prevention for improving the software quality. Earlier defect identification in software projects will make defect removal and prevention much easier. Software engineers generally take experiences from the past and prevent the defects from re-occurring. In this research paper our first section is the introduction of software defects, second section is the introduction of defect handling life cycle models, third section is use of Cost Constructive COQUALMO model for defect handling, fourth section is conclusions and last section is future scope.

Keywords: Defect, Defect Analysis, Defect Prevention, Defect Prediction, Root Cause Analysis

I. Introduction

Software Defect is termed as **"imperfections in the software development process that would cause that software to fail to meet the desired requirements".** A defect generally represents the undesirable aspects of the software quality. Generally we are concerned with three types of defects artifacts in this research paper and they are: Requirement defects, design defects and coding defects. [2].
defects occur during all the phases of the Software development life cycle. Hence defect prevention is very essential part of Software development Life cycle for improving the Software Quality.
Defect prevention firstly involves identification of defect, and then modification and changing the relevant processes, preventing the re-occurring of the defects in the development process. As early as defects are identified in the development process, the more smoothly the development process progresses.
For improving the quality of the Software process it is necessary to identify the defects from the given set of projects at the first step, then it involves classification and analysis of the pattern and after that it involves elimination for prevention of defects.[1].

II. Work flow Stages Defect Handling [2][1]

2.1 Defect Identification OR Defect Detection in Software Process

Defect Identification is the first activity involved for improving the quality of the Software Process. It is widely used in many of the Software projects, for discovery of the Software Defects, then documenting them for improving the quality of the Software product.

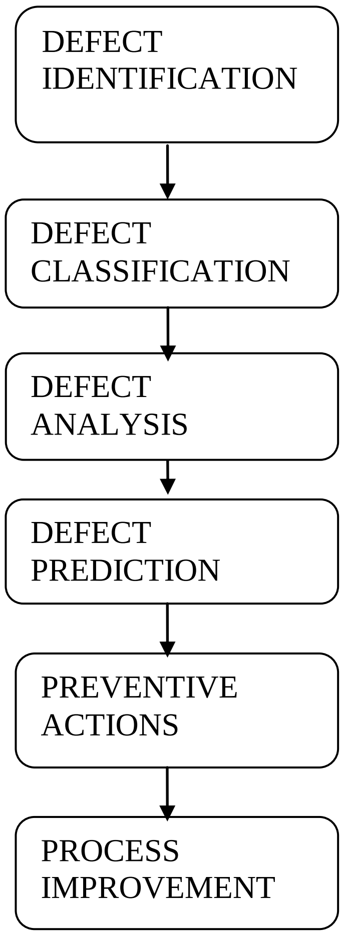


Fig.1

Variety of testing techniques used to identify the various types of the Software defects involved in the Software development process, will may involve either functional or non-functional domains. Hence in software development process firstly defects are discovered and then are documented. Output of Defect document information will be the input for defect analysis technique.

2.2 Defect Classification [2]
ODC classifies defect at two different points in time: One is Opener Section, where the defect were firstly investigated and second one is Closer Section, where the defects are fixed. For Small Sized and Medium Sized Projects defects are classified to first level of ODC to save efforts and time. For larger projects defects are deeply understood and analyzed. Firstly for all types of projects defects are firstly investigated and then they are fixed.[4]. Action planning and tracing helps in achieving the degree of defect reduction and cross learning.

2.3 Defect Analysis [1]
By the term analysis we meant the identification of the root cause of the defect and then further devising the solution to overcome the defect in further development process which will be further useful in improving the software quality and productivity of the software project. Some of the defect analysis techniques such as Fish Bone Analysis, Defect Classification and using defect taxonomies and the Root Cause Analysis (RCA). RCA goal is to first identify the root cause of the defects and then initiating actions for the defect elimination.

2.4 Defect Prediction Technique
By the term defect prediction technique we mean to identify and prevent the defect causing failures before occurring.
This is done by first gaining the experiences from the earlier Software Projects by Software Engineers and then identifying the root cause for the defects and then eliminating the causes.

Some Defect predictions models are COQUALMO model which we have taken and expanded
further in this research paper and the second one is mining defects using ODC. Identification of Defects at the early stages so that wastage in process and product development can be eliminated. And Cost efficiency which involves meeting the deadlines and leading to process improvement for many organizations.

2.5 Defect Prevention
By the term Defect prevention we mean that gaining the experience from the past projects by the software engineers and identifying the cause of Defects and further taking the corrective measure to prevent the defect re-occurrence [2].
Defect Prevention is one very important activity in the Software project thereby further improving the quality of the software project.
2.6 Process Improvement
By the term Process improvement we mean the continuously working for improvement for the quality of the software process. Process Improvement meant that following preventive actions for software improvement and then further taking actions for further improvement of quality.

III. Case Studies

COQUALMO-Defect Prediction Model [3]
COQUALMO is a Constructive quality model for the defect prediction density of the Software development. COQUALMO which basically predicts the defect density where defects conceptually flow from one phase to another thereby making larger defect and leading to project chaos [2]. Defect flow from one tank to another tank, thus making larger defect introduction pipes and then defects are removed with various defect removal pipes.
COQUALMO which is a defect prediction model is basically a two-step process which involves in defect identification (DI) at the first step and the Defect Removal (DR) model in the second step thereby leading to the defect improvement of the software quality. Hence two steps of COQUALMO are as follows:

3.1 Defect Identification OR Defect Introduction Model (DI) [3]
This model typically results in the development of various phases of software development life cycle models. There are basically three types of defects which mainly occurs during the development of various phase of software development life cycle which are as: Requirement defects, Design Defects, and coding Defects. For Defect identification we can use Defect. Introduction Range which is particularly the ratio between the highest and the lowest defect identification range. If the defects are identified in the earlier phases of the software development, the better will be the Software Development.

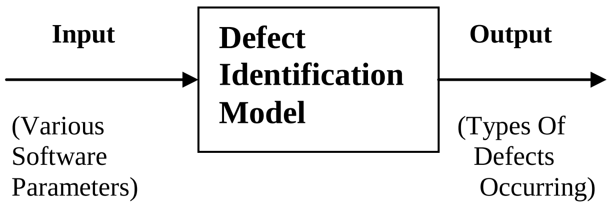

Input
(Various Software Parameters)
Defect Identification Model
Output
(Types Of Defects Occurring)

Fig. 2

3.2 Defect Removal (DR)
By the term defect removal we mean removing the defects such as requirement defects, design defects and coding defects which would typically results in the software failures. Defect removal basically results in the estimation of defect removal by the defect removal activity.

There are basically six orthogonal profiles for the defect removal which are very low, low, nominal, high, very high and very very high.
Very low, low profiles basically requires no peer reviews, no testing and simple compilers, nominal profile requires well-defined sequences, unit and integration and system testing and some more extensive compilers,High,very high and very- very high typically requires formal reviews and procedures, highly advanced testing tools and more formalized compilers.
For Very low profiles:

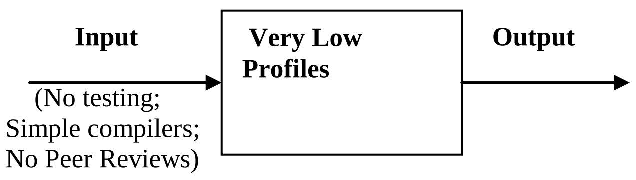


Fig. 3A

For Nominal Profiles:

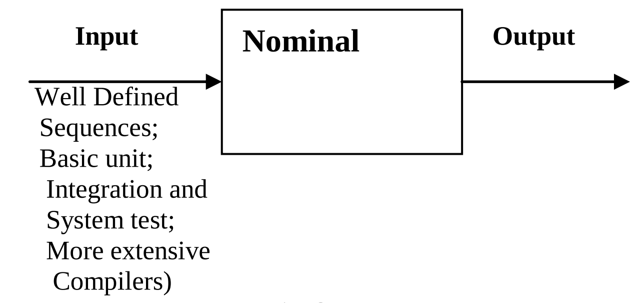
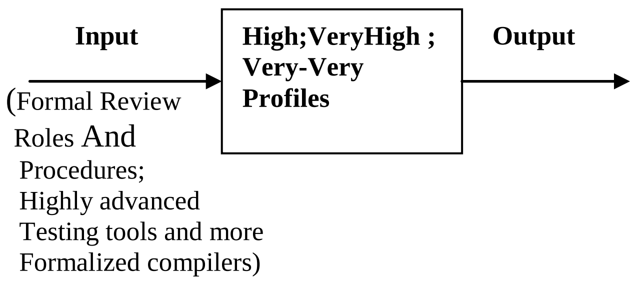


Fig. 3B

For High, Very High, and Very Very High Profiles



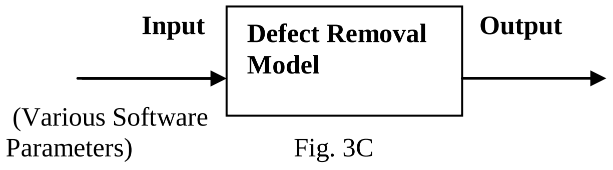


Fig. 3C

Basically three types of profiles occurs in the defect prediction in software modules [4]
Prop Minor = minor defects/total defects delivered;
Prop Major = major defects/total defects delivered;
Prop Extreme = extreme defects/total defects delivered.
Minor: It usually means small, a minor defect occurring in software projects does not affect the software much and doesn't make software unusable.
Major: It means large or more major defect occurring in software projects and making the application become unusable.
Extreme: It causes software totally unstable. A failure in any part of the application totally results in unstable software.

4. Conclusion

In this research paper we have first studied about the various types of defect techniques and then we have undergone through the survey of COQUALMO cost constructive model which is a two-step software defect prediction model for improving the software quality. Earlier we identify the defect introduced in the software, the better software will results. Hence, identifying defects at the earliest software development is very useful and leading to the prevention of software defects which will lead to failure.
The life cycle of defect identification consists of defect identification, defect classification, defect analysis, defect prediction, preventive actions and process improvement.
We have studied three techniques of Defect handling i.e. Defect Detection Technique, Second Defect Analysis Technique, and Defect Prediction Technique.[1]
We have work flow stages which consists of Defect Identification, Second action is Defect Classification, and Third action is Defect Analysis and Defect Prevention.[2]
But in this research paper we have used a Process Improvement model which includes Defect Identification, Second Action is Defect Classification, Third Action is Defect Analysis, Fourth Action is Defect Prediction and fifth action is Defect Prevention, and final Action is Process Improvement. Using these six work flow stages of Defect Handling provided us the added advantage for improving the quality of software projects, and follows a systematic approach, as in first phase we are able to identify the defect involved in the software, second action classifies Defects into opener section and closer section, third action that is Defect Analysis which identifies the root cause of the defect and then further devise the solution to overcome the defect in further development process, fourth action is Defect Prediction technique we mean to identify and prevent the defect causing failures before occurring, and is Defect Prevention Technique which means that gaining the experience from the past projects by the software engineers and identifying the cause of Defects and further taking the corrective measure to prevent the defect re-occurrence and finally action is for process improvement.
After that we have used COQUALMO i.e. cost constructive model as the case studies for demonstrating the fact of defect prediction technique.

But our Work Flow stages that we used in this paper are more complex, further increasing the number of stages of Defect Handling.

5. Future Scope

Since defect can cause malfunctioning in the software projects leading to software failures, so defect prediction is mainly necessary ,which is one of the important phase in the development of software development life cycle(SDLC).In this research paper we have used COQUALMO which is a two-step software prediction model, thereby improving the software quality. In future scope we can add various aspects for defect handling in various software projects. We can compare defects with various other techniques such as Genetic algorithm, neural network, fuzzy logic, decision tree for adding feature for handling defects in software projects.

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