International Journal For Advanced Research In Science & Technology
A peer reviewed international journal www.ijarst.in
ISSN: 2457-0362

Clean room versus Conventional Software Engineering Methods

[1]Mr .B.Vijay Kumar, [2]Mr.Venkat Ramudu,

[1]Associate Professor,[2] Assistant Professor,Dept. of CSE,
Malla Reddy Engineering College (Autonomous), Secunderabad, Telangana State

Abstract: From the very beginning of software engineering we have some pre defined steps to developing software which is termed as Conventional methods for software engineering which include all from analyzing the requirements, designing, implementing the software and lastly testing it for bugs. But such software used to have some weak points concerning the quality, originating from the method itself so now some new steps were defined called as Clean room software engineering method which gives more preference to the quality and reliability factor as compared to the previous one but has still not been accepted by all software developers due to its difficult approach and high resource requirement. So both the methods are used but at some specific place according to the need of the software and its developer. In this paper we will compare them on some basic yet important parameter to decide which approach is effective for which scenario.

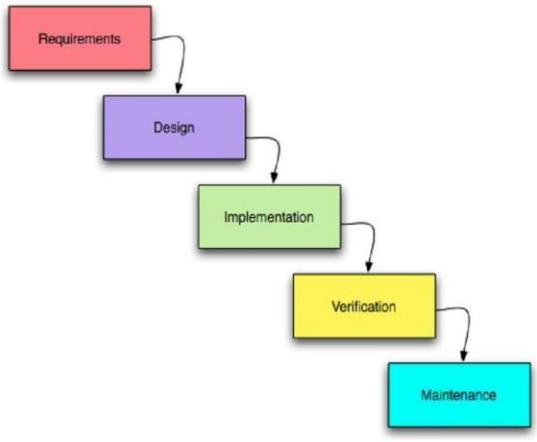
Introduction

Conventional methods for software engineering in general have the following steps: analysis, design, implementation, testing and then maintenance. But these steps were challenged by the new emerging method for software development i.e. Clean room software engineering which uses the Increment process model for its working. Here the steps may be bit difficult and time consuming but the software we get from this method are very high on quality and resultantly less on errors. In this paper we will be giving a short comparison between the two methods which in usual situation put a software engineer in a dilemma of which one to choose. We will be comparing them on the parameters like reliability, code correctness proof, quality of the product and lastly why clean room is not used commonly for software development. Then paper is divided into 3 parts. Firstly we will give a brief on the methods and their steps then second we will give the comparison on parameters as defined above and then the conclusion.

International Journal For Advanced Research In Science & Technology
A peer reviewed international journal www.ijarst.in
ISSN: 2457-0362

Conventional Methods for Software Engineering

This is a method that has been may be the very first approach to software engineering with few of the very sequential and predictable steps. Here we firstly analyze the requirement that the software has to satisfy and start with the designing and the coding process without paying emphasis on the correctness of the code as it is checked when the designing step is over and we move to testing of the software [1]. Most of the soft wares are tested using the test case approach which is considered to be effective under the conventional approach where we make a set of standard instructions with which we compare the code and test the code on some parameters and sometimes we mutate the code to see its behavior in some random situations to make the testing approach more practical. After the testing is over still the software is not considered error free so it is put in market as a beta version which has errors and when they get feed backs from the customers they make some final changes and the software is launched and is still found to be having the bugs. In the figure below we see how software is developed using a conventional approach to software development. When we made same software from both the methods the software developer of clean room said that they do miss the satisfaction of program execution of conventional method after testing but conventional software had less quality then clean room [2].



Clean Room Software Engineering

International Journal For Advanced Research In Science & Technology
A peer reviewed international journal www.ijarst.in
ISSN: 2457-0362

This approach is not new it's been there from mid 80s and found use in military projects in 1990s. The purpose of this method was defect prevention then defect removal. As told 'Do it right the first time' [1]. The main emphasis is on the prevention of any kind of error then removing it later on. This method is useful in situations like space programs where large amount of investment and human lives are at stake then we need a method that will avoid any kind of error as we can't test it before use. In such situation clean room proves to be extremely useful. Now in clean room we use increment process model where linear collection of small steps gives out complete software but each increment before integration to the whole goes through a set of steps.

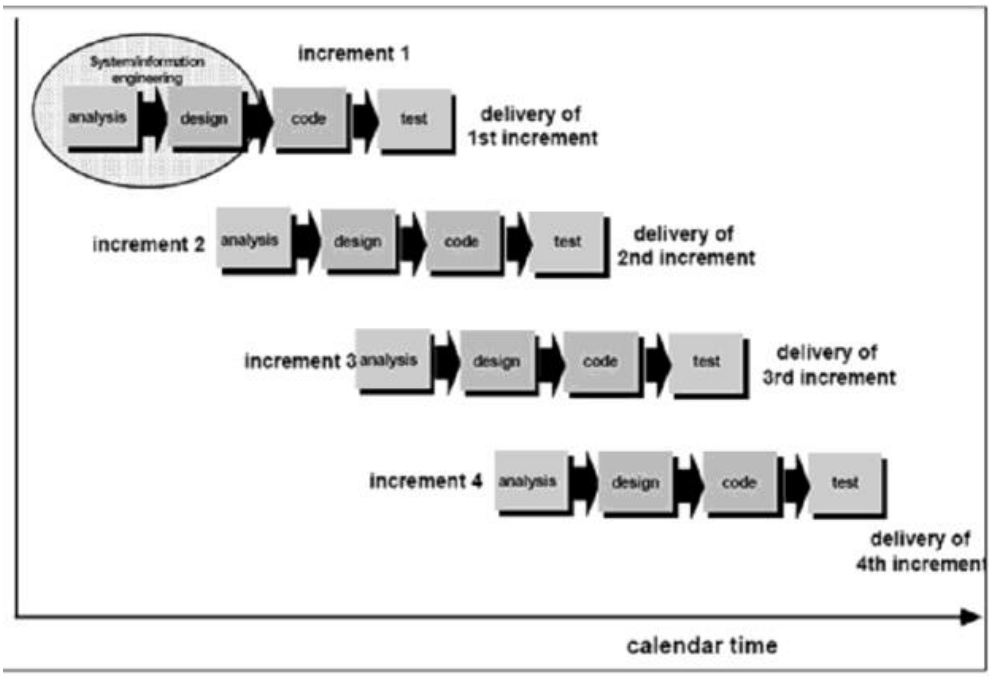


Figure 2 (increment process model)

Firstly we plan the size of each increment then we make the sequence in which those increments will be added followed by introducing the customer levelrequirement for that increment. Then using box structure, the formal design is made. After that we use mathematical (formal) methods to check the design thoroughly and we pass a theoretical proof of verification of its correctness [15][14]. Then, we conduct statistical use testing where the increment is tested using some finite test cases depending on the requirements that the increment is satisfying. Once the inspection, verification and testing is done the

International Journal For Advanced Research In Science & Technology
A peer reviewed international journal
www.ijarst.in
ISSN: 2457-0362

increment is added to the whole [1]. This way there is very less probability that any bug or error is still there and we get high quality products.

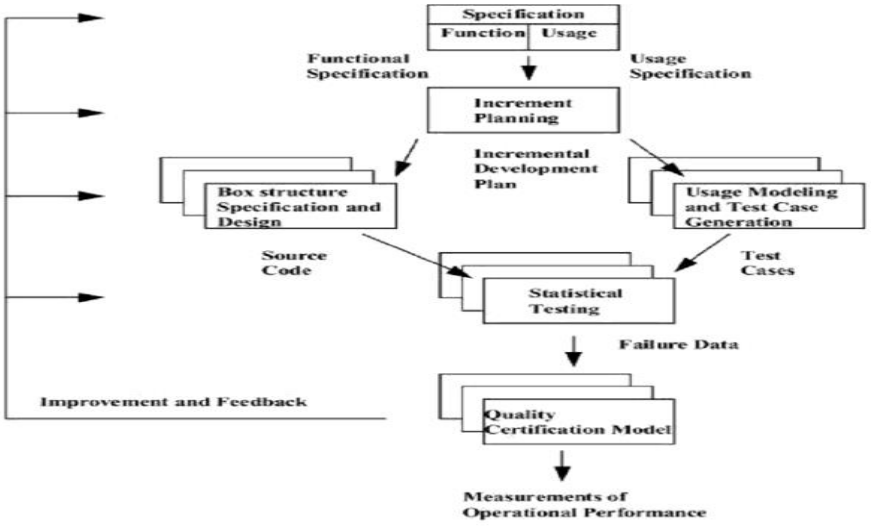


Figure 3 : Explaining the steps in the clean room software engineering method [3].

The above diagram explains the steps of clean room software engineering and how the software is compiled in this method.

Clean Room versus Conventional

Now we will compare these two methods on some basic yet important parameters on which a software developer chooses a method for software development. We will judge them on these parameters and see which one is better for which situation.

Reliability

As we have explained above when we are talking about reliability there is no comparison with clean room method[6]. It has proven its level of reliability and its increment process decreased the error rate to one tenth of usual and that was the factor which made clean room a preferred approach for space programs and military

International Journal For Advanced Research In Science & Technology
A peer reviewed international journal www.ijarst.in
ISSN: 2457-0362

projects because in these projects we have a lot of resources involved including there are lives at stake which makes no place for any mistake. So we use clean room there and there wouldn't be any doubt in saying that clean room is far more reliable than conventional due the accuracy it provides.

Correctness Proof

Now when we talk about the correctness proof we mean what we have to convince us that the software is correct or the code used is correct for that matter [15]. So we might want to take a closer look at the clean room method above where we have explained that each increment before being integrated in the whole is firstly verified for correctness after formal designing using multiple methods like mathematical (formal) methods which give the proof in this point. Because this process of verification is completely theoretical so we can say at the level of correctness proof clean room provides it while conventional doesn't.

Increment approach

This approach of using incremental process model is all that made the difference. Clean room is so different because it makes almost all its processes occur at the increment level [4]. The increments are the basic building blocks in this method. The first step is to plan the increments of the software and their size. Increment process increases efficiency of the product as we test each increment about 4 times at different levels before adding it to the whole. So increment approach is a big difference between the conventional approach and the clean room method. Quality of the Product When we talk about the quality of the product or software we are talking about minimum no. of errors or bugs and less execution time and to be flexible in all situations. And we have received such qualities from the software developed using clean room software engineering[14]. This method is a very accurate and as explained above the probability of errors is one-tenth of the conventional method it will not be wrong to say that products from clean room are far more higher in quality then the products from conventional. For e.g. IBM COBOL/SF restructuring tool (85,000 lines of PL/I code)[10][7][13].This application when developed by clean room had ten- fold reduction in total defects per thousand lines of code found during

International Journal For Advanced Research In Science & Technology
A peer reviewed international journal www.ijarst.in
ISSN: 2457-0362

testing. And that is why we are paying emphasis on use of clean room in the software industry now.

Conclusion

According to our literary survey, we can conclude that there is no doubt that conventional method is a very sequential and comparatively a easy option for software development. But when it comes to quality being priority and accuracy in first attempt then clean room has no competition. There is no doubt in saying that clean room is a far more reliable method and can find its place as the future of software development. But clean room is too theoretical, mathematical and radical for real world use.

So, we conclude from the our survey that according to the parameters used for comparison (reliability, quality of product, correctness proof etc) clean room is indeed far better option than conventional method but using it needs additional training to the engineering with use of some additional tools. And extreme discipline in software development. So clean room might find its place as the future approach to software engineering but in the present world conventional methods of software engineering is preferred approach to software engineering.

References

[1]. Software engineering a practitioner's approach 6th edition by Pressman.

[2]. Richard W. Selby, member, IEEE and Victor R. Basili, senior member, IEEE and F. Terry Baker, 1987, in IEEE transactions on software engineering "cleanroom software development: An empirical evaluation".

[3]. Chaelynne M. Wolak, DISS 725 April 2001 School of Computer and Information Sciences Nova Southeastern University, "Taking the Art out of Software Development: An In-Depth Review of Cleanroom Software Engineering".