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A Review of Empirical Modeling in Software Engineering

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Abstract: Empirical modeling improves software development activities by adding the capabilities in terms of computer procedures, associated documentation, and programs. The nature of software engineering is to develop, not produce and empirical is a human-based technology. Integrating empirical modeling in software development life cycle has been proved to reduce cost, time and effort. In addition, it helps to develop quality software and enhances reuse capability of software. The article includes all the associated methods of an empirical model that can help in developing new software with software engineering terminology. The empirical modeling helps in software engineering terminology for the application and tailoring of techniques, life cycle model and methods for estimating software problems, organizations, and projects. The empirical modeling is basically based on the experimental approach and relates with the applications of science and mathematics. This article is proposed for empirical methods to improve the software engineering approaches. A software engineering approach is a systematic approach for the development, operation, maintenance and termination of software.Currently, in software engineering, there is an insufficient set of models, lack of identification of limits of current technologies, lack of insufficient analysis and experimental approach. So here we introduced that why we need empirical methods for the improvement in software engineering.

Keyword:-Empirical modeling, adaptation, case study, focused group, observation

I. INTRODUCTION

An empirical model is basically based on the observations and experience instead of atheoryor it may be purely logical. The empirical model is presentedfor the verification of parameters, time and experimental approaches**.**Empirical software development effort and empirical model gathering is a kind of experience [1]. It is usually only an imperfect representation of the reality. The article includes, the empirical model focuses on the empirical approach (experimental observation, case study etc.). The empirical model based on the process control in software engineering terminology. Software development methodology is based on the defined process of control model in past many years. In empirical model agile methodology is used because the agile software development method scrum is basically dependent on the empirical process control model. Empirical process boosts sustainable development. Is also provides the facility to control and rebuild project solution that is based upon the goals and environment. An empirical model in software engineering uses statistical process control. It focuses on continuous improvement and the design of experiments. An empirical model of process control of software engineering is a method of quality control and it is applied tothe model and controls a process. It also includes charts, manufacturing graphs etc. Since the empirical modeling is an experimental approach so every model is basically based on the observations, survey, analysis [2]. In summary, the above introduction is empirical learning and empirical modeling. This article empirical model contains all definition of empirical methods.

II. CONSTITUENT OF EMPIRICAL MODEL

There is mainly three constituent of empirical models:

- **Transparency:** This transparency or visibility is a term that any fact of the process responsible for the outcome of operations is must be visible and transparent for the every person whoever involved in the software engineering process. The involvement of each person in the operation gives batter transparency and better communication to each of them.
- **Inspection:** The inspection is the second constituent of the empirical model which requires various and different facts of theprocess that should be inspected frequently so that unsatisfactory variances in the process which can be easily detected. So that the difficulties which may occur in future can be detected and recovered from that.
- **Adaptation:** The third and the last constituent of the empirical model is anadaptation. It requires that the analyzer that should adjust the process if one or more facts of the process are in an unsatisfactory

range [3]. This constituent comes in last after all the two constituents have been accomplished successfully. Adaptation is process to acquire and use in a positive manner for the sake of future empirical model enhancement.

III. PROCESS OF EMPIRICAL MODEL OR LIFE CYCLE

The empirical model is defined by the means of figure of life cycle model which enhance and elaborate the process of theempirical model. In software engineering development process we collect the data which are required or it may be called as requirement gathering.After the requirement phase, we go through the second phase i.e. planning of theproject. Each and every software development process needs planning to control the software process. The next phase of theempirical model process goes to anobservation which tries to observe and analyze the software development iteration. After the observation phase, theempirical methodology is implemented for the improvement quality, high performance, and maximum utilization of resource, reduces the cost and improves the functionality of the software development process. Then the review it to be done for the software development process which reviews the condition of the software that it is to be implemented or not by the yes or no condition. If the review is correct then the implementation process goes to yes and on the other hand, if the review of the software development process is not up to the mark then it goes to the re-defined data phase. The re-defined phase comes if the condition is no then this re-defined phase collects all the data which are wrong at the time of review and passes all the collected data information of the software development process to the observation phase in the form of a cyclic process.In the process of theempirical model all the conditions and phases are correct then implementation phase comes in for the implement of software development process.After the implementation phase, the testing phase goes on to test the software for identifying the bugs, performance, and functionality of the software.

At the last when the software is ready after passing from all the phases successfully of the process of empirical model or life cycle of theempirical model. In figure.1 empirical method is proposed to overcome the problems of the software development and also to reduce the cost of the software, enhance the functionality with high performance, and reduce the time utilization.

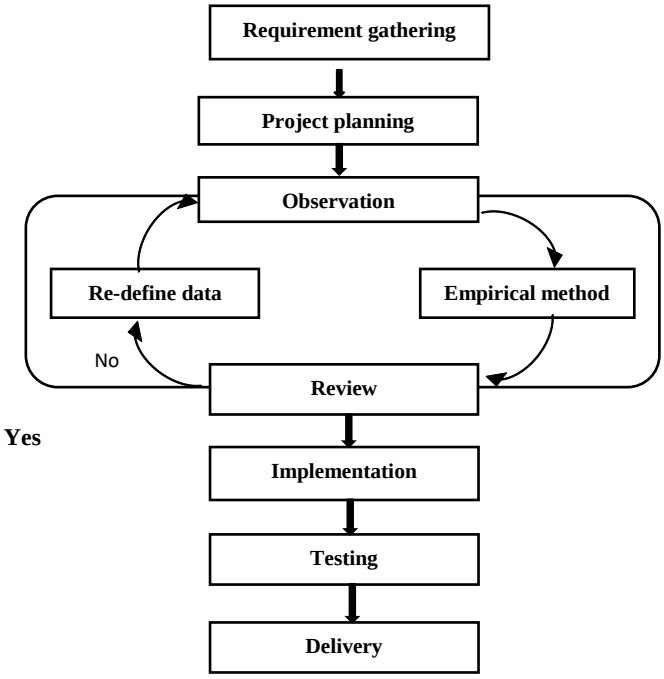

Figure .1Process of Empirical modeling

The above figure of empirical model is proposed to analyze and improve the software development methods by using this empirical model.

IV. NEED OF EMPIRICAL MODELING

As there were unexpected highercost and time than the usual incurring during software development, empirical modeling has been introduced. Basically, in software development process, there is theminimum utilization of resources which are to be utilized. By using the empirical modeling in software engineering we can improve the utilization of resources up to the maximum point.

Software engineering is a process forconstructing software with all the combination of logics, programs, and mathematical issues. Software engineering does not have well-understood guidance [4]. Software engineering researchers don't have a research strategy and standards for analyzing the quality of overall results they make a largenumber ofattempts to recognize all the elements of the software engineering research. They do not have sufficient technique to examine the relation between software engineering process, tools, and methods. So the empirical model reduces all these demerits of software engineering process. Empirical model mainly focuses on the software development process and it also follows the software engineering parallel process. The empirical model provides the excise control by adaptation and frequent inspection. Software development is based on theempirical model to develop the complete software but the software developmentdoesn't generate the same output every time given several inputs, so the empirical model helps to define the process of software development control model. Nowadays the empirical study in software engineering is

growing for the improvement of less mature technology and validating themature technology **[5].**The empirical model consists of several types of empirical methods that are used to improve the software engineering development process. The empirical model improves the software technology maturation it includes the six typical phases i.e. popularization, concept formulation, basic research, external enhancement and exploration, development and extension and basic research

V. METHODS OF EMPIRICAL MODELING

There are a lot of empirical methods to improve the software engineering process or development methodologies [6]. They are as follows:

A. Interview

The interview is the most appropriate method of an empirical method. This method verifies the observations and experimental reports. There are several types of questions asked in the interview to prove the software engineering research and observation. The questions are given below:

- Does X exist? Where X is proposed method or system
- Is method navigation something that actually does?
- Is efficiently actually a problem in a current system?
- What is X like? What are the properties of X?
- How can it be characterized?
- How can we observe efficiency for this X?[7]

The above various types of questions asked in interview sessions.

B. Experiments

The experiment is the method of anempirical model that can be used in software engineering terminology. An experimental approach involved in data stats, case studies, and observationscan be used to validate the proposal about processes involved in software development methodologies.

C. Case study

A case study is the method of the empirical model and it is a part of empirical research method. A case study is not a case history and these studies are powerful empirical methods that are used primarily for exploration of investigations with regards to prospectively. It attempts to understand the phenomenon or create a theory. The case study is collecting data, analyzing data, and presenting the data. For software engineers, a case study approach use to examine the strategy of software engineering process [8]. Case study fundamental includes the exploratory questions and validation fails to improve the quality of software engineering process.

D. Observation

Observation is the most critical techniques or method of the empirical model. Observation is used to analyze the data statistics, vector point, development stats and extreme variables. It helps to software engineers to improve the quality of data variables and data values. It is finalizing the software engineering process variable outputs. Observation technique determines the different variations among the different development effort.

E. Survey

The survey is the most appropriate empirical method that is used to analyze people statement and estimation technique.The survey has to identify the values to improve the quality of controlled experiments [9]**.** This survey method is commonly used in current scenario to know the people's concept and perception about any research or development methodologies. It comes under the empirical model because survey helps to understand the scenario of developers, stockholders or users. The survey contains some predefined and posts defined questioners.

G. Documentation analysis

Document analysis technique or method is one of the most effective ways of power starting the requirement elicitation phase in software engineering process. It is the art of studying relevant system, business, and research documentation. It is the method of gathering information before elicitation process with stack holders to perform document analysis; the analysis should always check the source of a document.

H. Focused group

Software engineering community has started to analyze empirical research methodologies to improve the validity of research results. There is a need to experiments increases the experimentation attention. The focused group method is one of the most effective methods to obtain experiences from practitioners and users [10]**.**It can provide qualitative information-rich content that is expensive to gather with other methods**.**

VI. MOTIVATION BEHIND EMPIRICAL MODELING

A. *The motivation from practitioner's perspective:*

a) Selection of software technologies

Motivation for practitioners to develop a software or product is high because empirical model increase the scope of selecting software technologies, where user can select the software technologies according to their choice with the help empirical model strategy.

b) Supporting adoption and use of new technologies

The empirical model motivates the practitioners to adopt the new strategies or empirical method to developing a new thing. According to practitioner's perspective, the empirical model helps to increase the efficiency of their development techniques.

B. *Motivation from researcher's perspective*

a) Increased Understanding about the Concept

The empirical modeling has proposed many empirical methods that can help researchers to understand the meanings of contexts.

b) Introducing software technologies

The empirical model helps the researcher to create coherent explanations of the experiences. It helps to the researcher in proposing new software technologies.

c) Determining the Impact of software technologies

The empirical method provides several methods for determining the impact of software technologies. It also provides the comparing systems that are used to compare the impact of software technologies.

VII. SUCCESS FACTORS OF EMPIRICAL MODEL

Success factor of empirical model in various domains (i.e. reuse, improvement)

I: Success factor for reuse

The empirical model relates with the reuse terminologies. It implies the all kind of experiences and products but not just code. In empirical model reusable experiences requires information for easily identifying and selecting it**.** Reuse terminology of an empirical model has to be fully incorporated into the development process model.

II: Success factor for improvement

The empirical model relates with the improving. Success factors are used for improving the software process and products**[**11]. On the other hand, empirical model improves the software process like system learning with the eliciting, recording, analyzing, interpreting and finalizing experience. It improves the packaging experiences and repository of integrated experience.

VIII. CONCLUSION

In this paper, the empirical model views closely incorporated with various domains. The empirical model describes the fully incorporated methods that are used in process of software engineering mythologies. In the future, many methods may be proposed with the context of an empirical model that helps to improve the current scenario of research methodologies and software development methodologies. This article is presenting an overall review of the methods of an empirical model in software engineering in today's scenario. All the methods which are included in this paper are an observation and experimental approach that provide the method based on experiences. These strategies define the empirical modeling to overcome from the problem of high cost, more time utilization, and performance. In this conclusion, it proves that the empirical model most appropriate strategy that can be used in software engineering process. For researchers, an empirical model most appropriate strategy to observe the experimentation, process, data static and data variables. Hence we can say that an empirical model is necessary or we can say that it is mandatory to all the peoples who are involved in the software engineering process.

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