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WINGS TO YOUR THOUGHTS.....

A Study for Software Engineering Metrics for ERP Development Projects

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Abstract: Software metrics provide a quantitative and qualitative basis for the development and validation of models of the software development process. Metrics can be used to improve software productivity and quality. Effective management of any process requires quantification, measurement, and modeling. This paper will focus on the software measurement and metrics and their significant key roles in ERP systems. A company's ERP system is like the heart of the System body. If the system is healthy it will provide an accurate information to the organization, brings a better interaction between the customer, suppliers and the organization and coordinate organization resources in efficient way. Since ERP systems are made large and consist of many sub systems, managing those leads too difficultly. Many ERP system fails because of an inappropriate decisions of ERP team and due to bad quality of the ERP systems. In this paper the researchers have come up with a solution to develop a framework that focus on the importance of software metrics and the efficiency of managing, quality, performances and for the accurate decisions for the ERP systems. In future, by using this framework it can enhance the efficiency or the accuracy of the existing ERP systems in many organizations.

Keywords: ERP System, Software metrics, Quality, Efficiency, framework.

1. INTRODUCTION

Today's business organizations are in need of a well-integrated management system reasoning the business environment's instability. Companies cannot foresee their business processes and take crucial decisions by dealing with the resources in unfitting and untimely manner. There should be a unified real-time view of core business operations to handle the enterprise resources in an effective way by combining all units of the company effectually. Enterprise Resource planning system facilitates the company by offering incorporated common control to all the resources and making the use of that resource efficient.

But today's case, most of the ERP systems which are in use are lack in good productivity and quality due to the failures in the system to manage the enterprise resources in significant manner. Too much customization of ERP systems results in slow down the operations and transactions may not be recognized immediately due to the inefficiency of those systems.

Since the ERP system can be defined as a vital business tool to accomplish company goals, to prove that, the systems are in need of good framework to produce good quality product to overcome the issues of failing to set measurable targets for Projects. Since software products are becoming more complex projects. Such systems are beyond the abilities of individuals and their evolution poses further challenges. It is necessary to have precise, predictable, and repeatable control over the software development process and product. Moreover, software projects are often late, exceeding the allocated budget, and fail to perform as expected [1]. Therefore, as a way out for the above mentioned weaknesses, the proposing solution for the framework for software engineering metrics would be an effective solution for ERP system. This research paper is focused on a study for

software engineering metrics for ERP projects and how it will be affect the software metrics of ERP projects.

Under the research paper has Introduction, Research objectives, Literature review, Methodology, Results, Discussions and Conclusion. The literature review shows what the existing frameworks for software metrics are and what are the pros and cons of them. Main goal of the research is to provide good framework for ERP projects which is highly affected for its software metrics.

2. LITERATURE REVIEW

The Authors S.Parthasarathy and N. Anbazhagan have proposed a software metrics plan (SMP). Two Hypotheses have been formulated & tested using Statistical techniques to validate SMP. The proposed SMP have been tested practically and found that it enables the ERP system to resolve many issues. For the future work to propose a software tool to execute SMP and to generate a project database for each ERP projects to make results of SMP [2].

S.K.Mukti, P.Tripathi and A.M.Rawani of this paper evaluate the quality of ERP systems and proposed an Evaluation method to measure the quality using Usability, Functionality, and Reliability and Efficiency factors from User's point of view in order to avoid the failure issues of ERP system. [3].

S.AKronbichler, H.Ostermann and R.Staudinger discussed on the important models developed and the overview of the different approaches of the existing models to analysis the pros and cons of each model and the cases in which it can used for the failure in ERP systems. [4].

B.Jovicic, D.Djuric, N.Milicic and V.Devedzic analyzed the data from the dynamic perspective of different metrics to ERP systems in an Agile approach to solve the problems that were like to identify what are the things that are used often, what are the things that not used, and which ones are worthy of investing our time in improving in the ERP system. [5].

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J.Esteves, J.Pastor and J.Casanovas focused on with different metrics to monitor sustained management support while implementing ERP system by using GQM Approach to solve the critical factors issuing for failure of ERP system. [6].
Guy Janssens, Rob Kusters, and Fred Heemstra focused on how affect the software metrics with size of ERP system. Research team performed to search set of variables which are used to define ERP project with its sizes. [7].
Fiona Fui-Hoon Nah and Janet Lee-Shang Lau focused on critical factors on successful implementation of ERP system. 11 Critical factors are found by exploring difficulties of ERP system. Good communication, good leadership and good top management and other factors are caused to successful of enterprises resource planning system [8].
Lars Brehm & Armin Heinzl M. Lynne Markus focused on portfolio of tailoring options between modifications with risks, difficulties of ERP system upgrades. Authors mainly describe framework for solving modification problems in ERP systems [9].
Irene Vanderfeesten, Jorge Cardoso, Jan Mendling, Hajo A. Reijers, and Wil van der Aalst focused on use of quality metrics for business process modeling and it gives summary of business process metrics. [10].

3. OBJECTIVES

The main objective of this research paper is to study the software engineering metrics and propose a framework to be used in ERP development projects so that the companies with ERP system can use this framework and enhance the efficiency and accuracy of the existing ERP systems. Listed below are some of the specific objectives which the paper is based on:

- To measure the performance and quality of the ERP system while Implementing, due to the requirements changes in organizations.
- To identify the usage of software metrics and their pros and cons to the ERP system.
- To identify the knowledge how software metrics can be beneficial for the ERP system from the relevant people.
- To give better decision making to the ERP Team.

4. METHODOLOGY

Reasoning the high accuracy, real time and effective way to gather responses by conducting limited simple steps, the research team has decided to collect needed information by using questionnaires. Assuming the quality of the criteria contained in questionnaire can be measured through a quantitative approach, direct and crucial questions were asked to determine how well a framework for software metrics can be adopted to ERP systems which are presently used in Sri Lanka. As the first step of conducting the research, the research problem was defined clearly and literature reviews were collected related to the problem. Using quantitative and qualitative researches, research design was conceptualized and data collection was created by using two approaches; questionnaire and observation. Questionnaire was targeted to a particular audience who are currently working in the business industry, related to Information Technology field.

Number of 11 questions were asked from the audience and as another method, observation was done by referring the related literature reviews. Out of total population, 50 % of responses in the questionnaires were taken as the selected sample and the collection of data were analyzed in order to develop a framework for analysis in the future. The framework can be evaluated in ERP systems in actual scenario and it will rest as the future work that to be implemented. Founded the feedback for the assessment, it expresses the need of a framework for respondents and courage to build software metrics based on the framework, giving answer to the research “A Study for software engineering metrics for ERP development projects”.

5. RESULTS AND DISCUSSION

5.1 Results:

This section analyses the results of the 58 Questionnaires from the targeted group and the observation obtained from the literature Review.

The First question was based on the Position of the participants in the industry. Majority people who took participation in this survey was other stakeholders from the industry, the next 24% and 22% was Software Engineers and Software Developers.

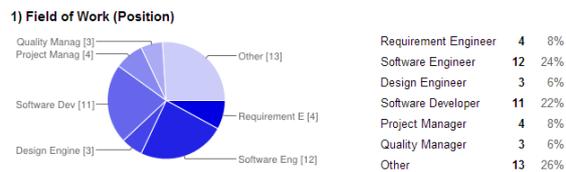


Figure 1: Position of Participants

Second Question was focused on the years of Experience. Most of the participants having from one to three years of experience and the percentage is 57%. While 27% are having from three to six years of experience.

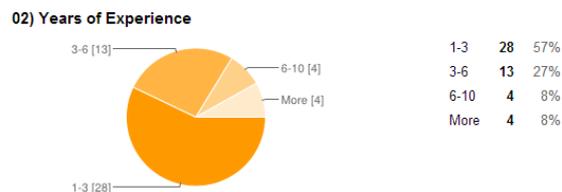


Figure 2: Years of Experiences

Third Question was evaluated about the knowledge in Software Metrics. 94% of the sample population have told yes while 6% have told No.

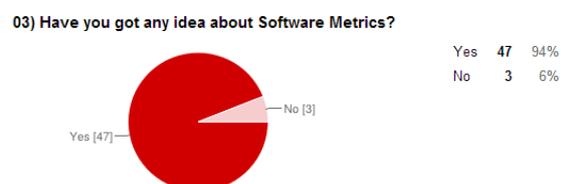
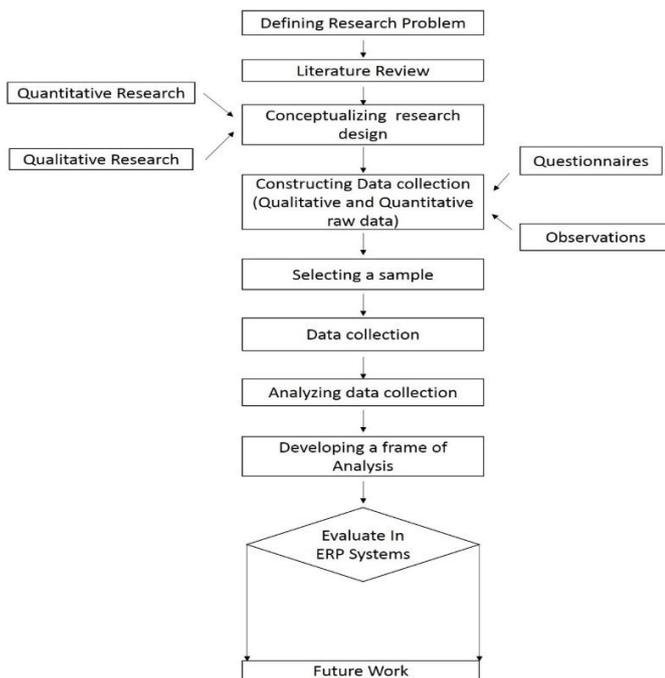


Figure 3: Knowledge on Software Metrics

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Fourth question was charged to know that was there any advantages of using software metrics in industry and 46 participants told yes while others told No. The fifth Question was based on if there was any advantages of using software metrics and certain criteria was given to rate them.

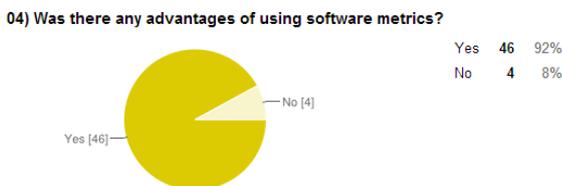


Figure 4: Advantages of using Software metrics

Sixth Question was concentrated on types of metrics that are advantage to be used and 59% told Quantitative while others told Qualitative.

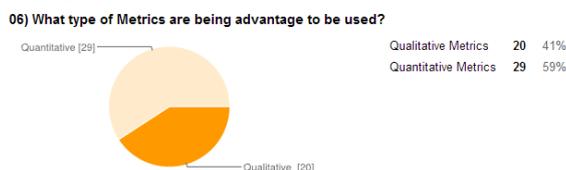


Figure 5: Type of Metrics Used

Seventh Question states as per the respondents, requirement metrics got the highest number of responses of 45% out of total percentage of responses. It formed a conclusion as requirement metrics are the metrics commonly used.

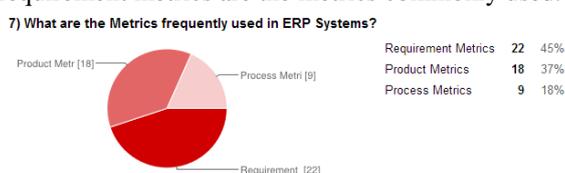


Figure 6: Frequently used Metrics

Eighth Question was asked to ensure whether the respondents have done any projects using software metrics or its related specifications. Out of total responses, 72% of responses were recognized as Yes, they used software metrics beforehand.

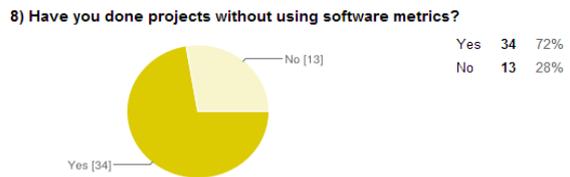


Figure 7: Projects done using Software Metrics

Ninth Question was asked to confirm whether there are any risks involved in using software metrics. The result was found out 51% of respondents were experienced risks in using software metrics and 24% of respondents were not gone through any risks. The conclusion has formed as there is a slight risk involved in using software metrics.

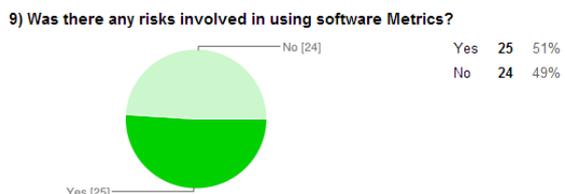


Figure 8: Risks Involved in Using Software Metrics

Tenth Question tells the respondents have been questioned to determine whether there are any failures occurred in ERP systems when using software metrics. Out of total responses, 63% of responses were marked as there are no failures in software metrics when it is used ERP systems. Therefore the conclusion has made as implementing ERP systems with the help of software metrics can be done with less failures.

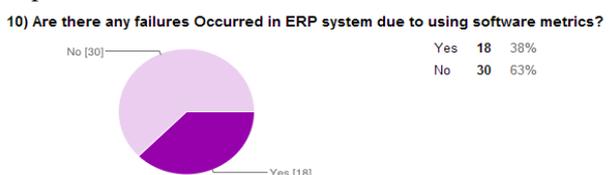


Figure 9: Failures occurred due to using software metrics

Final Question was asked to determine whether the software product is sufficiently tested by developers. According to results, 67% of responses were marked as Yes out of total number of responses saying that the software products which developers build are sufficiently tested before they used by the client.

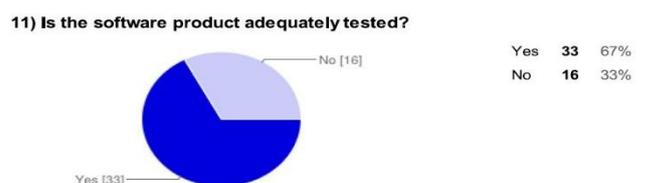


Figure 10: Is software product adequately tested

5.2 Discussion

Through the results of questionnaires', Software Metrics provides objective information throughout the software

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development project. This reduces the ambiguity that often surrounds complex and constrained software projects. Metrics can accurately describe the status of ERP systems processes and products and make it easy to understand complex sub systems.

Using software metrics, can have a quality system at the end of the project, with advantages like less bugs, Increase return on investments, Manage workloads, Reduce Overtime and Reduce cost.

According to the responses from industrial participants, software metrics measurement can support the quality, performance and decision making process in ERP system appropriately. Specially in providing accurate information, better interaction between customers, suppliers and the organization, to coordinate organization resources in efficient way and ability to manage large and complex systems.

From these results it shows that most of the industry people have some knowledge about software metrics and have experienced the advantages and also failures in using the software metrics. Failures can be occurred due the lack knowledge in software metrics in the organizations.

As stated Quantitative metrics had advantages and requirement metrics were frequently used in ERP software projects. Quantitative metrics by using statistics analysis like regression analysis, Mean Time to Failure prediction system based on historical data and more can be used to predict accuracy of the ERP systems.

Requirement metrics define the output measures of the software process. Requirements are like,

- Functional requirement which specify a function that the software is capable of performing. For example, functional requirements might state that the system must provide some facility for authenticating the identity of a system user.
- Non-functional requirements on the other hand are not functions, but qualities or behavior that users want.
- Product requirements which are related to performance, reliability, usability and portability of the ERP system.
- Process requirements related to standards. Programming languages for the system.
- Other requirements are like User requirements, System requirements.

By using requirement metrics such as volatility, traceability, size and completeness and tools can be can be helpful. As told above those metrics can be considered when developing an efficient framework for ERP systems.

Since this study was done in academic level, as in future can target for large number of population in order to make this results more accurate to propose a solution to develop a framework for software engineering development projects.

6. CONCLUSION

Since ERP systems are made large and consist of many sub systems, managing those leads to difficulties. Much ERP system fails because of inappropriate decisions of ERP team and due to bad quality of the ERP systems.

This research paper focused on the influence of the software metrics in the ERP system. Software Engineering metrics

have both the advantage and the disadvantage in ERP System based on the questionnaires results and the observation obtained from the related research papers. Disadvantages can be listed like Needs lot of effort and time and Company policies that not allow to use metrics. Advantages are enhancing the performances and the quality of the ERP system and provide a better decision in making.

According to the responses from industrial participants by Using Software Metrics the ERP team can get a better decision in making. Since the research was done in academic level only questionnaires and observations were analyzed and results were obtained to bring up a solution to build a frame work, as a future work, the frame work can be developed and can be used to evaluate in ERP Systems in any organizations.

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