Review of Software Development Size using Use Case Point (UCP) Method with a Modified Set of Environmental Factors

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Abstract

Software testing is a very broad area, which involves many technical and non-technical areas, such as specification, design, implementation, maintenance, process and management issues in software engineering. UCP is an estimation method that provides ability to estimate size from its use case. Researchers had proposed many size estimation techniques. This research paper shows modification of estimating interactive software project size with enhanced use case point. A critical study shows that how we can improve efficiency of original method of size estimation enhanced use-case point. Estimate interactive software project size with Enhanced use case method and stored procedure with transaction will integrated for find the result with more efficient. Calculation of use case point are not difficult main difficultly is in defining use case and actor. UCP gives the measurement of the testing software development project and also ensures complete system documentation. Firstly use case document of project is prepared on the basis of requirement collected and all the factor are determined and analyzed on the basis of their complexity to estimate size.

Keywords: Use Cases, Use Case Points (UCP), Software Cost Estimation, Environmental Factors

I. INTRODUCTION

Estimation size is an activity that should be performed for prediction of cost and time for any software that is to be developed. Cost estimation models like COCOMO [1][2] and size estimation models like Function Point analysis (FPA) are well known and frequently used in research activity. Earlier, these models were applicable only to procedural paradigm, and are not directly applicable to software products developed using the object oriented methodology. With object oriented inclination of software developer, use cases emerged as a dominant technique for structuring requirements. Proper software cost estimation is the foremost activity adopted in every software development life cycle. Several features offered by OO programming concept such as Encapsulation, Inheritance, Polymorphism, Abstraction, Cohesion and Coupling play an important role to manage the development process. Currently used software development cost estimation models such as, COCOMO and Function Point Analysis, do not provide accurate project size and effort estimates. These techniques have been proven unsatisfactory for estimating size and effort because the LOC and FP are unknown at initial stage. UCP Method to Estimate Test Effort- A Mathematical Model:

1) Obtain unadjusted actor weight (UAW)
2) Determine unadjusted use case weight (UUCW)
3) Calculate unadjusted use case points (UUCP)
   UUCP = UAW + UUCW
4) Determine the technical/environmental factor (TEF)
5) Compute the adjusted use case point (AUCP)
   AUCP = UUCP * [0.65 + (0.01 * TEF)]
6) Arrive at final effort using a conversion factor
   Total Actual Effort = AUCP * CF

II. RELATED WORK

Fantechiet et al. [3] stated that Use Case formalism was an effective way of capturing both Business Process and Functional System. Researchers discussed the use of methods, based on a linguistic approach, analyzed functional requirements expressed by means of textual (NL) Use Cases. The aim was to collect quality metrics and detect defects related to such inherent ambiguity. Bente Andaet et al. [4] investigated one promising method, the use case point's method, which was inspired by function point analysis. Different companies developed equivalent functionality, but their development processes varied to a heavy process with considerable emphasis on analysis, design and code quality. The use case point method was close to the actual effort of the company with the light size development process. Ayman Issa et al. [5] described the availability of software

size estimation models that fit the different software development environments. Researchers reported on the development of three novel use case models based software size estimation methods. Use case rough estimation method, use case patterns estimation method, and object point's extraction estimation method. The accuracy of the proposed methods had been investigating doing a wide spectrum of software projects. Jose Antonio Pow-Sanget et al. [6] described that estimation of effort and size was still one of the hardest tasks in software project management. There were many techniques such as Function Points, Use Case Points and COCOMO, but there was not much information available about how to use those techniques in non-waterfall software lifecycles such as iterative or spiral lifecycles projects. The majority of approaches to estimate projects, even when defining as independent from technologies and lifecycle, had a characteristic highly influenced by waterfall lifecycles. David J. Coe et al. [7] proposed that Use case document key product functionality had been used as the basis for estimating software product development efforts. The Use Case Points (UCP) method used to estimate development effort for a semester-scale software product. The sources of estimation inconsistency are examined and recommendations for improving the consistency of the estimation process are presented. Commercial UCP software tools also help top relevant errors by automating many of the UCP calculations. Qu Yiet et al. [8] stated that Software quality becomes an important factor in software marketing. It was well known that software size was an important activity to ensure software quality. Researcher's presents a model for use case verification points and size case number prediction based on UCVP. The results from this study on the linear relationship between size case number and UCVP support claims that the size case number prediction helps early estimation size. Caio Monteiro Barbosa da Silva et al. [9] explored most important phase regarding Software Project Management is planning. Estimation must be taken into account considering human, materials, infrastructure, time, and budget. Generally, depends on technical, environmental, human and political factors. Planning also affects software final size and development effort. Planning helped to verify and reveal which were the activities that might cause project lateness. The strategy to get accurate estimate was the utilization of a well-defined software process, where documentation was continuously improved. Zhu Xiaochun et al. [10] explored that Software size was more and more important as it is a widely used activity to ensure software quality. Size execution becomes an activity in the critical path of a project. Estimation of size execution effort can benefit both seizer managers and software projects. An approach which mainly consists of two parts: size case number prediction from use cases and size effort size Imation based on the size suite execution vector model which combines size case number, size execution complexity and its seizer together. Kasi Periyasamy et al. [11] stated that estimated size of development was one of the most crucial and daunting tasks for a software project manager. UCP uses use cases as the primary factor; use case model is the first model developed in an object-oriented design process using UML. Estimating the size of development of a software product is a daunting task. Gustavo Bestetti Ibarra et al. [12] proposed a method to use technical variables. Technical variables can be measured from a brief description of use cases and related system requirements. The size of each use case of the system is derived from three technical variables: UCTP (Use Case Type Points), NBR (Number of Business Rules) and NUIR (Number of User Interface Requirements). The total size of the project was the sum of use case size adjusted by technical and environmental factors. This method was utilized in the Labor Court of Santa Catarina - Brazil to provide support to the negotiation process with third party companies that outsource software development. Ali Bou Nassif et al. [13] stated that Software estimation was a crucial task in software engineering. Software estimation encompasses size, effort, and schedule. Several commercial and non-commercial tools exist to estimate software in the early stages. Most software effort estimation methods requires software size as one of the important metric inputs and consequently. One of the approaches that have been used for about two decades in the early size and effort estimation is called use case points. S. Ajitha et al. [14] stated about realistic software size estimation. Software size estimation was required in various subject area of Software Engineering. Especially to predict performance of software system using Software Performance Engineering approach, software size was an important input parameter. Several estimation procedures are available in Neural Network model presented advantages over normal estimation procedure. Software size represents one of the most interesting internal attributes of a product. Software size estimation had been employed in several effort/size models as a predictor of the effort and size needed to design and implement the software. Ali Bou Nassif et al. [15] focus on a new regression model is created for software effort estimation based on use case point model. Fuzzy Inference System (FIS) approach is applied on this model to improve the estimation. Yaeghoo byavari et al. [16] stated Software estimations were based on prediction properties of system, with attention to development methodology. In object-oriented analysis, Use Case models describe the functional requirements of a software system, so they could be basis for software measurement. Use Case diagrams contain the functional requirements of the target system that determined during the requirement analysis phase. The main focus on elements in Use Case diagram (Use Cases and actors) and attention to non-functional requirements in software system provide an estimation method. Nisha yadav et al. [17] focused on size effort estimation was a vital activity which includes certain as well as uncertain elements. Researcher provided method to estimate software size efforts using UCP (Use Case Points) and made it very useful for today's software development process. Researcher compared it with other conventional methods. At last researcher correlated use cases and size cases. Then, by applying mathematical model researcher find final size effort which was more accurate size effort estimation for any project. Jonathan Lee et al. [18] stated that Software estimation was an important and difficult activity in project planning and management process. Project estimation based on function point or use case point (UCP) methods provided fixed complexity grades. which cannot deal with the uncertain and imprecise conditions. Researcher proposed a metric to calculate the unadjusted use case points. Use cases based on the relations between each use cases and goals with the fuzzy membership functions. Furthermore, the technical and environmental factors considered to calculate the use case points. UCP can be used to estimate the implementation time and effort of the system under development. Chetan Nagar [19] described that IT industry wants a simple and accurate method of efforts estimation. Estimation of efforts

before starting of research was a prediction and prediction always not accurate. Intermediate COCOMO considered 17 factor that affecting the efforts, UCP considered 13 Technical Complexity Factors and 05 Experience factors. There was a lot factors that can affect efforts estimation .Most of the parameter were covered by COCOMO and UCP, but some parameters which are included in COCOMO left by UCP. Qiudong Yu et al. [20] compared the common estimation method with UCP estimation method. The estimation methods of software development in software industry, UCP estimation method applied to Software Industry to estimate the workload. UCP estimation 23 methods to the estimation process improvement of the companies in Software system industry, which had been proved significantly improved the accuracy of calculate workload. Mohammed Wajahat Kamal et al. [21] stated that Reliable and accurate software development effort estimation was always been a daunting task for project managers. The use of Use Cases for software effort estimation was gained wide popularity. Researchers from academia as well as industry had shown interest in the Use Case based approaches because of the promising results obtained along with their early applicability. Researcher presents a set of attribute-based criteria to classify and compare these approaches and provide such aid to practitioners. The set is also meant to guide researchers interested in proposing new use case-based approaches. Ali Bou Nassif et al. [22] stated that a novel Artificial Neural Network (ANN) to predict software effort from use case diagrams based on the Use Case Point (UCP) model. The inputs of this model were software size, productivity and complexity, while the output was the predicted software effort. A multiple linear regression model with three independent variables (same inputs of the ANN) and one dependent variable (effort) is also introduced. A new feed-forward Artificial Neural Network (ANN) model to predict software effort based on the use case point's model. Jaber Alwidian et al. [23] present a new approach in size estimation process that enhances a software size estimation method called (Use Case Point method). Researcher promotion was a suggestion to use a set of sixteen factors which considered as the most influential factor in Jordan environment that are used to promote a COCOMO II model. Priya Chaudhary et al. [24] stated that Software size effort estimation was always been an on-going challenge to software engineers. As size was one of the critical activities in project life cycle. Researcher utilized the organizational effort data to calculate Absolute Error and Relative Error in the estimates done by two different models. Finally the statistical data obtained at the end points that "Size Case Point Estimation" was a better technique for estimations. Ali Bou Nassif et al. [25] stated that Software effort prediction was an important task in the software development life cycle. Many models including regression models, machine learning models, algorithmic models, expert judgment and estimation by analogy have been widely used to estimate software effort and size. A Tree boost (Stochastic Gradient Boosting) model was put forward to predict software effort based on the Use Case Point method. The Tree boost model can be used for software effort estimation and can compete with other regression models. Hen-Tin Lee et al. [26] proposed Software effort estimation was an important activity for effective project management. The prediction of efforts in the early stage of a software project development, Researcher proposed an effort estimation model along with a software effort estimation process to estimate project efforts from high level WBS. The proposed estimation model is composed of four original task assignment factors – team size, concurrency, intensity, and fragmentation and one newly proposed factor, named WBS effort. Abu Wahid Md. Masud Parvez et al. [27] proposed that estimation of size was been more critical and magnitude as companies need to present or bid. Therefore, model was extremely necessary to apply economic and systematic estimation model or process to enhance the accuracy in estimation. The benefit of the new model was to increase the performance and effectiveness of the use case point estimation model. Software development including software outsourcing industry, estimation was always an important and tough task. So, to develop better model which going to help more effectively and efficiently to the software companies in size effort estimation. Mohammad Azzeh [28] stated that applicability of Use Case Point estimation model to global software project development. Estimation model leads to several challenges in project management, especially global project management. Effort and size estimation were two of these significant challenges. A slight variation in the value of height will dramatically increase use case points and therefore the total project effort. Even small adjustment, for instance half point, will vary the final result by 40%. However, this means that inappropriate environmental weight factors would lead to catastrophic result. Ali Bou Nassif et al. [29] stated that Use Case Points (UCP) was a well-known method to estimate the project size, based on Use Case diagram. Researcher aims to study the potential of using Fuzzy Model Tree to derive effort estimates based on UCP size measure using a dataset collected for that purpose. The proposed approach was been validated against Tree boost model, Multiple Linear Regression and classical effort estimation based on the UCP model. The obtained results were promising and show better performance than those obtained by classical UCP, Multiple Linear Regression and slightly better than those obtained by Tree boost model. The proposed approach has integrated Fuzzy Modeling with Model Tree to produce a hybrid approach called Fuzzy Model Tree. The proposed approach starts with using Fuzzy C-means to partition training dataset into several clusters where each instance may belong to different clusters with different membership values. The obtained membership values were then used to construct Fuzzy model using MATLAB function i.e. genefiz3.Pragya Jha et al. [30] focused on the Software developers depend on use cases to described the business processes of object- oriented projects. A use case consists of the strategic goals and scenarios that provide value to a business domain; they could also provide insight to a projects complexity and required resources. The traditional models for size estimation are no longer used effectively due rapid changes in technology. UML based Use case point is found to be robust one for the size estimation having no influence of complexity of language, complexity of 29 development platforms etc. Calculating the software development effort using Use Case Point method is found to be a suitable method. Many of the authors had done remarkable work on effort estimation using use case points by considering the external technical factors and environmental factors.

III. PROBLEM FORMULATED

It is the core element of study because if the problem is not clear than a good study or research cannot be carried out. So the exact statement of the research problem is "To analysis size using UCP method by modification of Environmental factors". Various techniques were used to estimate size of project by assigning points to use cases, and we are going to identify and analyze total size efforts. We will study UCP Technique to estimate size effort which includes many environmental factors that can be analyzed to achieve objective.

IV. CONCLUSION

According to the research evaluation UCP method is much more efficient, accurate and advantageous. It includes complete requirement document (use case) in earlier stages. By the modified method enhanced cost estimation in use case point we got better UCPs because stored procedure transaction is used. Developers may have more accurate cost by using this modification. In the proposed scenario we are finding increased scope to estimate the cost. As per our proposal, we found that there is need to modify some parameter which is lying between available in current scenario. Using those parameters we are concluding that our proposed scenario is to increase the scope to estimate the cost.

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