A REVIEW OF DIFFERENT APPROACHES/METHODOLOGIES USED FOR PROGRAMMING EXERTION ESTIMATION

[1]Yogesh Kumar, [2]Rahul Rishi
[1]Research Scholar, UIET, MDU Rohtak

Abstract : In software improvement environment anticipating the product exertion by utilizing the estimation reproductions have squeezed impressive responsiveness among explores. Envisioning the most sensible utilization of exertion important to build or support programming in light of incomplete and provisional information is called as programming improvement exertion estimation [64]. Contribution to extend plans, spending plans, emphasis designs, offering rounds, valuing procedures, and venture examinations are utilized as a part of exertion estimation. This paper summarizes several approaches of software cost estimation models and techniques : Fuzzy logic , Knowledge Based, Expert Judgement, Analogy Based, Multiple Linear Regression, Function Point and COCOMO based, Neural Network.

Index Terms **– Fuzzy logic, Expert Judgment, Analogy, Regression, Function point, Neural network.**

I. INTRODUCTION

Most of the software package estimates ought to be performed at the start of the life cycle, when we don't however grasp the matter we are attending to solve. Effort estimation is used to predict how many hours of work and how many workers are needed to develop a project. The effort invested in a software project is perhaps one in all the foremost vital and most analyzed variables in recent years within the method of project management. Estimating the hassle with a high grade of dependableness could be a downside that has not however been resolved and even the project manager has got to subsume it since the start. The ample methodologies utilized for programming exertion estimation are pondered as :

1. Fuzzy Logic Approach:

Fuzzy systems try to emulate cognitive processes of the brain with a rule base. The basic concept is inspired by the human processes where the decisional criteria are not clear cut, but blurred and it is difficult to find objective to make the decisions more precise and clear. Fuzzy decision systems are based on fuzzy logic that tries to reproduce the fuzzy human reasoning. This section compare and analyze the use of fuzzy logic in the existing models and provide review of software and project estimation techniques existing in literature, its strengths and weaknesses.

Sr. No.	Year	Method	Strengths	Weaknesses
1	2009	Fuzzy based model [2]	Reliable software testing effort	Critical software testing being higher
2	2011	Fuzzy based model for software testing effort estimation [4]	Easily capable of incorporating uncertainty	Inaccurate and uncertain data. Deals with semantic knowledge
3	2013	Algorithmic software effort estimation model [1]	Better estimation capabilities	Inadequate and insufficient information about size and complexity
4	2014	Intermediate COCOMO model [3]	Performance of fuzzy inference system(FIS) improved	Imprecise & uncertain data, extremely complex nonlinear relationships between variables.

5	2015	Assertion-Based testing metrics technique [5]	Effectiveness with results & increased performance	Assertions very costly

2. Knowledge Based Approach:

In contrast to earlier literature, knowledge is viewed as residing within the individual, and the primary role of the organization is knowledge application rather than knowledge creation. This section compare and analyze the use of Knowledge Based Approach for LOC and effort estimation in the existing models and provide review of software and project estimation techniques existing in literature, its strengths and weaknesses.

Sr. No.	Year	Method	Strengths	Weaknesses
1	2011	Extended ANGLE [6]	Accuracy is improved	Tough task, badly in boundary values
2	2014	Estimation of manufacturing lead time for extremely complex engineered-to-order projects [8]	Improved accuracy of lead time estimation.	Increase unpredictability
3	2014	Cost-estimation of deep drawn sheet metal parts [9]	Flexible, can be extended or modified easily	Time consuming task
4	2017	BZT method [7]	More effective	Complexity of individual functions as well as integration tasks.

3. Expert Judgement Approach:

Expert Judgement (EJ) is used extensively during the generation of cost estimates. Cost estimators have to make numerous assumptions and judgements about what they think a new product will cost. EJ is examined in terms of what thought processes are used when a judgement is made. However, the use of EJ is often frowned upon, not well accepted or understood by non-cost estimators within a concurrent engineering environment. Computerised cost models, in many ways, have reduced the need for EJ but by no means have they, or can they, replace it. The cost estimates produced from both algorithmic and non-algorithmic cost models can be widely inaccurate; and, as the work of this section highlights, require extensive use of judgement in order to produce a meaningful result. Very little research tackles the issues of capturing and integrating EJ and rationale into the cost estimating process. Therefore, this section compare and analyze the use of Expert Judgement Approach for effort estimation in the existing models and provide review of software and project estimation techniques existing in literature, its strengths and weaknesses.

Sr. No.	Year	Method	Strengths	Weaknesses
1	2007	Inconsistency of expert judgment [12]	Reduced budget-overruns, enhanced schedule and improved quality software.	Inconsistency is expected
2	2007	Forecasting of software development work effort [13]	Use best estimation models.	Lack of information
3	2015	Expert judgement studies with multiple experts [10]	Better forecasts	Defensible estimates

4	2016	Probabilistic modelling [11]	Appropriate in context, better validity and verification	Uncertainty and probabilistic risk assessment

4. Analogy Based approach:

An alternative approach to estimation based upon the use of analogies. The underlying principle is to characterize projects in terms of features (for example, the number of interfaces, the development method or the size of the functional requirements document). Completed projects are stored and then the problem becomes one of finding the most similar projects to the one for which a prediction is required. Similarity is defined as Euclidean distance in n-dimensional space where n is the number of project features. Each dimension is standardized so all dimensions have equal weight. The known effort values of the nearest neighbours to the new project are then used as the basis for the prediction. This section compare and analyze the use of Analogy Based Approach for effort estimation in the existing models and provide review of software and project estimation techniques existing in literature, its strengths and weaknesses.

Sr. No.	Year	Method	Strengths	Weaknesses
1	2009	PCA(Principal Components Analysis) [18]	Prediction performance increases	Critical tasks in project management
2	2014	Analogy-based Software Effort estimation (ASEE) [17]	More accurate estimates	Practitioners was still limited
3	2015	Analogy-based effort estimation [16]	Improve prediction accuracy	Hard to identify single method.
4	2016	Two analogy based software code effort estimation techniques. [15]	Generate more accurate estimation	Negative impact on effort prediction accuracy
5	2017	Differential Evolution Algorithm [14]	Well-organized memory utilization, minor computational complexity, and lesser computational effort	Extremely sensitive to the appropriate selection of control parameters

5. Multiple Linear Regression Approach:

Multiple regression analysis (MR) is a highly flexible system for examining the relationship of a collection of independent variables (or predictors) to a single dependent variable (or criterion). It is a statistical approach used to describe the simultaneous association of several variables with one continuous outcome. This section compare and analyze the use of Multiple linear regression approach for effort estimation in the existing models and provide review of software and project estimation techniques existing in literature, its strengths and weaknesses.

Sr. No.	Year	Method	Strengths	Weaknesses
1	2013	AREION: based on multiple regressions with adaptive recursive data partitioning [21]	Improves accuracy of effort estimation and achieves robust and stable results	Highly affected by the data distribution
2	2016	Decision threshold estimation [22]	Threshold prediction achieved from 12-tone system to fifty seven in the state of art.	System performance depends on the accuracy of threshold estimation.

3	2017	High-resolution yield estimation [19]	Do not require any site-specific measurements, can be readily extended to other regions and crops	Benefit was limited
4	2017	Multiple Linear Regression [20]	Simpler, easier to apply in practical situations	High degradation of cultural heritage and risk in failure

6. Function Point and COCOMO based Approach:

The development of software industry, leads to scale increasing in applications and a variety of programming languages using at the same time, manual measurement based on the LOC (line of code) cannot meet the estimating requirements. The emergence of function point resolves these difficult issues. It helps to estimate software effort more accurately without considering the languages or developing environment you choose. This section compare and analyze the use of Function Point approach for effort estimation in the existing models and provide review of software and project estimation techniques existing in literature, its strengths and weaknesses.

Sr. No.	Year	Method	Strengths	Weaknesses
1	2007	Neuro-fuzzy Constructive Cost Model (COCOMO) approach [25]	Greatly improves estimation accuracy	Imprecise and uncertain input
2	2010	Differential Evolution [27]	Good estimation capabilities	Challenge in accurate estimation of software projects cost
3	2014	Multi-layer feed forward neural network [26]	Improves the estimation accuracy	Network becomes sensitive with sigmoid function.
4	2015	COSMIC function point Method [24]	Manual and automated methods for measuring outputs are in agreement.	Ontology's are insufficient and also do no satisfy basic requirements.
5	2016	E-COCOMO [28]	Solve the real time problem of effort calculation	Critical task in software project management
6	2017	Convertibility is analysed statistically via regression techniques [23]	Different functional size methods of measurements are strongly and structurally correlated.	Magnitude of the conversion errors

7. Neural Network Approach:

In recent years, a number of studies have used neural networks in various stages of software development and compares the prediction performance of multilayer perceptron and radial basis function neural networks to that of regression analysis. The results of the study indicate that when a combined third generation and fourth generation languages data set were used, the neural network produced improved performance over conventional regression analysis in terms of mean absolute percentage error. This section compare and analyze the use of Neural Network approach for effort estimation in the existing models and provide review of software and project estimation techniques existing in literature, its strengths and weaknesses.

Sr. No.	Year	Method	Strengths	Weaknesses

1	2015	Empirical Validation of Neural Network Models [33]	Developed mathematical model	Small size of dataset.
2	2015	Bootstrap based Neural Networks [32]	Shown better results compared to traditional effort estimation.	Reliable effort estimation was difficult to achieve.
3	2016	Multi Layered Feed Forward Artificial Neural Network Technique [31]	Provide better results and accurately forecast the software development effort.	Providing accurate estimations of software was still very challenging.
4	2017	Artificial Neural Networks and pattern recognition [30]	Allows direct computation of a velocity for each detected bubble or droplet.	Required sophisticated instrument devices.
5	2017	Artificial Neural Network [29]	More accurate and is also capable of solving highly nonlinear problems.	The "training of ANN" step requires the deeper involvement of the user, which makes the approach difficult to use.

II CONCLUSION

From the discussion of above approaches/techniques we can say that every method have strengths and weaknesses. In any software project, accurate estimation cannot be generated by using just one approach/technique. In order to make precise estimation, combination of techniques and data from past projects should be considered[34]. It is highly recommended that organizations employ multiple approaches for accurate exertion estimation. It is also recommended that organizations should build a good repository of historic projects, and in turn use the data for effective benchmarking and continuous improvement.

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