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Hybrid Fuzzy Knowledge Based Prediction Model for the Software Development and Maintenance Quality in Software Engineering Approach

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Abstract*: The main arena of Software Engineering development with ood design, development, coding, testing, implementation, deployment of the software, finally maintaining the software with good functionality. For the development of software many organizations are investing more and more budget in their revenue. Software Engineering development has several categories of data presented in software engineering such as Graphical User Interface, Usage graphs, writing text, realities and images. Significant information be able to be obtained from this composite data by well recognized data mining techniques such as association, classification, clustering etc. By discovery hidden patterns by data mining software engineering data is made illegal. Software Engineering development has many objectives in software engineering such as Code and Design optimization, Project documentation, Development cost estimation etc. Variety of significant data mining method in each phase of software development life cycle supports in realizing these objectives proficiently and the failure rate of software is decreased. . This paper focused a new hybrid model like combination of Fuzzy Logic and knowledge management offers a significant method for developing models for software quality prediction. This research paper explains about exercise of estimate and valuation at a particular organization by developments and represents the outcomes attained with a fuzzy based classification and knowledge model for the fuzzy knowledge management predication for the quality of software engineering Approach. This result illustrate that the significance of Average Error Evaluation Efficiency observed and used in fuzzy logic is lesser than Average Error Evaluation Efficiency used in another regression multiple regression; while the value of prediction is higher value that other prediction models is used before. Thus Results demonstrate that Hybrid fuzzy knowledge management predication for the quality of software engineering can be used as alternative for predicting the Software Development and Maintenance Quality (SDMQ).

Keywords: Software Quality Prediction, Fuzzy Logic, knowledge management, Software Development

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I. INTRODUCTION

History of Computer science, Software Quality Prediction has been well-known Challenges for computer (Fredrick 2003). There is no standard techniques or methods and model of assessment important and un expected from all developers. For software development quality can be used some classification methods like Fuzzy logic. It can be used for development and significant tool for estimation; Briand and Wieczorek, 1996). Soft computing technique likes fuzzy logic, case based reasoning have been used by several researchers for estimation of development cost and time in Software Engineering In this research paper a Hybrid fuzzy knowledge based prediction Model for the Software Development and Maintenance Quality in software engineering Approach has been developed. Further this paper compares estimations obtained with Hybrid fuzzy knowledge based prediction Model for the Software Development and Maintenance Quality in software engineering Approach. For developing the model, three quality metrics have been gathered for dataset collected from the projects developed by different projects from different projects. In this paper different quality metrics are used like Human Computer Interface (HCI), Error Evaluation Efficiency (EEE), User Documentation and Guideline (UDG) and Software Maintenance.

A. Fuzzy logic

Fuzzy logic can be theorized as a simplification of standard logic. Recent fuzzy logic existed and developing by in the year 1960 and classic model those difficulties in which imprecise data need to be used and derived rules of inference are expressed in a right common method creating procedure of diffuse types. In neural networks, fuzzy logic is an important properties of a classification model. And gives a more and new specific measurement and description of their performance. It will specify that different operators and considered as comprehensive output tasks of computing components. Learning algorithm has been specified in fuzzy logic is used. It offers appropriate method to make a input and output spaces using fuzzy rule system and it express as fuzzy system. This research focuses and represents a classification based on fuzzy rule based system, it has three fuzzy inputs, namely Human Computer Interface (HCI), Error Evaluation Efficiency (EEE) and User Documentation and Guideline (UDG) producing one output Software Development and Maintenance Quality (SDMQ) as shown in Figure2.

It uses different properties of fuzzy operators namely. OR, AND, Negation. The edge settings define four values of the purpose in x,y plane with 45^0 Diagonal.

B. Fuzzy Inference rule based system

A characteristic of fuzzy Inference system contains of 4 key components Figure.1 presented as below

1. Fuzzification: has morphological values, and it produces fuzzy output from non-fuzzy input. It takes like inference mechanism
2. Knowledge base: has two important Units 1) Data base 2) Classification rule (sets, rules for implications) Fuzzy conditional based on rules are in declarations (implications).
3. Decision logic: its makes logical thinking and condition derived like decision making
4. Defuzzification: It maps and produce output from fuzzy classification to normal or non-fuzzy standards.

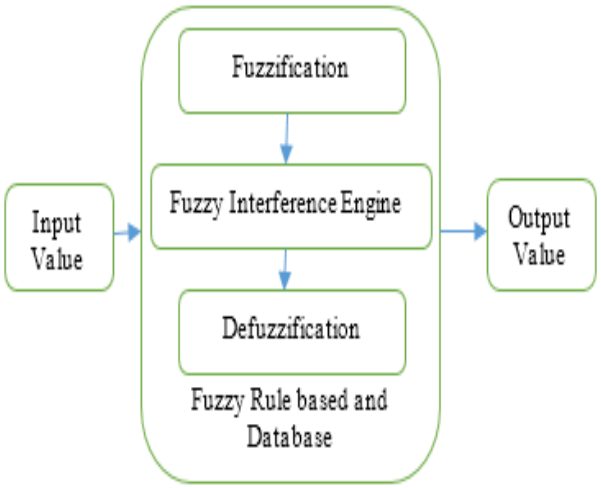

Fig 1. Explicate a model for valuation Fuzzy Logic

C. Knowledge management Concepts

The part of knowledge management as the important basis for reasonable benefit in different organizations in society, it has develop a passionately discussed subject. Certainly, it is a essential capability aimed at generating reasonable benefit. In this entire places that knowledge management is dynamic and important, consequently, at principal objective that organization should define and identify the knowledge management condition, and then to attain a favorite idea, express a knowledge management policy and plan. Business and Software Companies nowadays are fronting significant experiments and problems such as the want to decrease the time-to-deployment in market, the software design development and implementation and maintenance costs, or to manage different software products with variety of technology. As a effect, this present condition is positively encourages the execution of new management methods such as knowledge management to increase and adopt the competitive advantages in software organizations. By this knowledge solutions we measure the quality and effectiveness of the software development and maintains the quality analysis of the challenges which is meet.

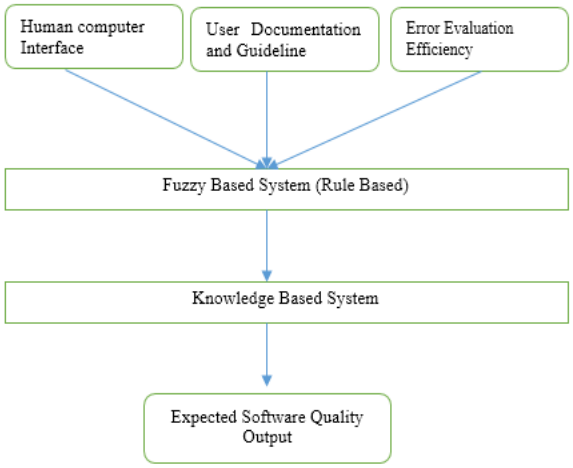

Fig 2. Explicate a model for valuation knowledge management

In this paper, to explicate a model for valuation knowledge management along with a fuzzy Classification methodology. Knowledge management is a multidimensional notion and a imprecise methods. For this reason, fuzzy classification and a knowledge-based method for the capacity measurement and valuation of knowledge management in software development issues.

II. LITERATURE REVIEW

Developing and Designing the project to viable growth projects is never be new idea of real time applications. The procedure or Algorithm to reach the main goal of viable growth was implemented as an outcome projects [2, 3]. Nevertheless, main problem of reaching to meet the enhanced effectiveness and efficiency of the outcome projects in the real-time deployment should be addressed well in good quality. This paper is discuses about the risk, errors and drawbacks of the recent projects and has implemented as an outcome projects and some research are analysis the above issue also [4]. Hence, many research center and groups of research scientists more focused on implementation of advanced techniques associated with specific concerns issues of project success rate , project risk valuation, project rank valuation [5], some development projects also based on quality prediction [6,7], and consequently on. This paper is discussed about the potential resolution to diminish these development problems and analysis about the which was main problem area of developed projects like risk management [8]. Some papers are focused on knowledge management [9] and main ethics and rules were more successfully. Taking effective success of the objective position into explanation can be Effective project execution absolutely. It needs constant project quality eminence valuation, A assessment might able to complete to well-defined outcome software projects, for model, in software construction or engineering, where well-defined methods of project rank valuation [10]. The stated reasons can be avoided by implementing soft methods in successful and well output projects to measure the project status in milestones which with unethical and insincere approach, may outcome in inexact and impracticable project status valuation [11].

The PMBOK guides explained that risk assessment and code design development projects and defines the product of risk existence possibility and the economic risk impact in the project [12]. Meanwhile in numerous cases, it was challenging to define the risk possibility assessment straightly and to compute the risk effect rate, another approaches of representing the standards are stated [13, 14].There are many researchers' looks over the risk management and issues and they concentrating the projects over the research. The paper [21], Actually RIPRAN™ method (RIsk PRoject Analysis) has been used for the risk assessment based on probability and influence on the project with fuzzy approach and implemented the this approach to find the overall risk value of the software development and quality analysis. This paper had an idea to maintain the part of sustainability risk assessment and quality management project.

III. PROBLEM STATEMENT

The development of good quality software products still its lagging in the market and software society, there are many factors are affecting the quality of software products. Through this research can be identified different nonfunctional and functional needs to maintain the quality.

IV. PROPOSED HYBRID FUZZY KNOWLEDGE MODEL

There are many authors seriously deal with handling project knowledge in their research working. The paper in the area of knowledge management, It highlighting of the significance of post-project level application in sustainability projects is the influence of project development. One of the main motives is that concentrate and constant plans are usually executed in widely expanded project groups in different software development. The knowledge management ideologies shows an significant part of these projects and quality management

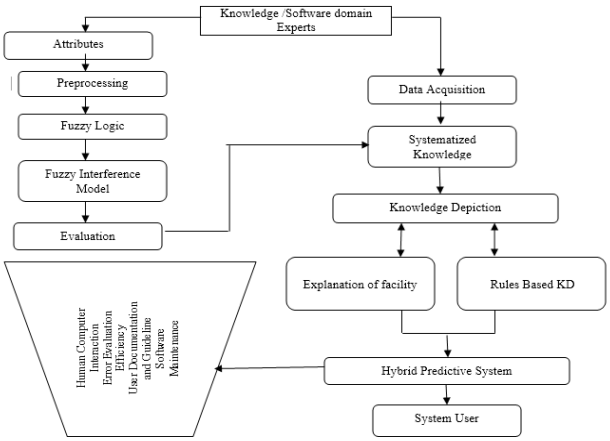

Fig.3. Proposed Prediction model

V. RESEARCH METHODOLOGY

A. Metrics used

Software quality of a product is measured in terms of "fitness of purpose" (3) (12). That is, the more a product conforms to the requirements laid down in SRS document, the greater is its quality. The metrics have been used Human Computer Interface (HCI), Efficiency of Error Evaluation (EEE) and User Documentation and Guideline (UDG) producing one output Software Quality (SQ) input into fuzzy classification. The following software metrics is taken for evaluating the quality of the software.

1. HCI (Human Computer Interface): HCI was identified and evaluated as the comparative measurement of prepared and clearly displayed, on a range from 0 to 10.
2. EEE (Error Evaluation Efficiency): EEE identified and evaluated as the comparative measurement of meaningful error messages displayed by the outcome software, on a range from 0 to 10.
3. UDG (User Documentation and Guideline): UDG evaluated as the comparative entirety of the user Guideline and manual or help file, on a range from 0 to 10.
4. SDMT (Software Deployment Maintenance): SDMT was evaluated as the comparative measurement of deployment maintenance efficiency, on a range from 0 to 10.

The above metrics has been analyses by the software experts who is working in multinational software companies and experts who can able to rank the various projects on range that range has been taken as a predicted quality output

VI. EXPERIMENTAL RESULTS AND DISCUSSION

A. Data observation

The hundred and ten project developed by under and Post Graduate students during their final semester were evaluated for quality metrics. The snapshot of the projects are depicted in Table 1.

B. Create and Methods to Construct Fuzzy Rule

The word fuzzy construction model usually refers to the methods and procedures for constructing fuzzy models from data. The domin and software industry expert information in a stated form is transformed into a conventional of if– then rules. A certain model construction can be formed, and factors of this construction, such as association functions and weights of rules, can be adjusted using input and output data. For our research presentation, we have used the Mamdani-type fuzzy rule based system. Here a general rule has following format:

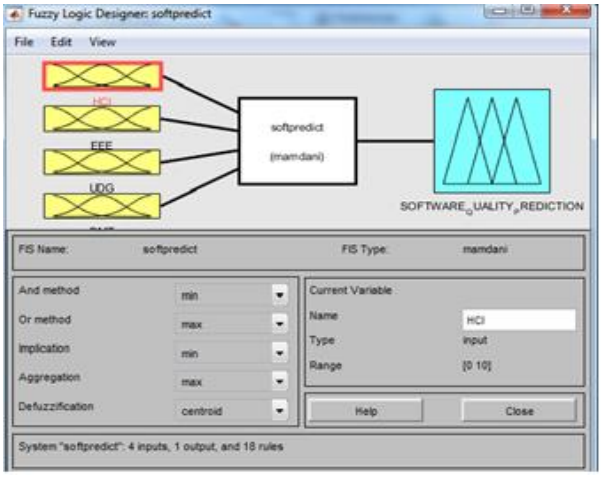

Fig.4. Fuzzy Logic Design of SDMQ

Table 1. Projects Id and metrics, Human Computer Interface (HCI), Error Evaluation Efficiency (EEE), User Documentation and Guideline (UDG) and (SDMT) Software Development and Maintenance Quality (SDMQ) (ranks)

Project No	HCI	EEE	UDG	SDMT	Quality Output
1	8	7	8	7	74.5
2	5	4	7	8	55.5
3	4	5	5	3	43
4	1	0	1	6	16.5
5	8	8	7	7	76.5
6	4	5	7	8	56
7	9	8	9	9	86.5
8	3	2	2	4	27
9	1	1	2	3	15.5
10	6	5	8	8	63.5
11	8	7	3	7	67
12	3	2	6	6	37
13	2	2	7	5	33.5
14	1	2	7	5	30.5
15	1	2	7	4	28.5

C. Estimate the Efficiency of valuation

A given method is used for the prediction of software quality model is the Error Evaluation Efficiency (EEE) which is defined as follows:

$$EEE = \frac{|\text{Meet quality} - \text{quality over Predicted}|}{\text{Original quality}}$$

In Software Quality Development, experts took each observation and estimate the Error Evaluation Efficiency value is calculated. The aggregation of Error Evaluation Efficiency over multiple observations from 1 to N, the summation can be accomplished through the Average Error Evaluation Efficiency (AEEE) as follows:

$$AEE = \frac{1}{N} + \cdots \sum_{i=0}^{N} EEE * N$$

D. Software Development and Maintenance Quality

(SDMQ) =

$$\left(\begin{matrix}\text{HCI} * 0.3 + \text{EEE} * 0.35 + \text{UD} * 0.15, \text{DMT} \\ * 0.2\end{matrix}\right) \text{X } 10$$

A corresponding standard is the prediction at different level can be identified by above illustrations.

E. Linear regressions

In multiple regressions there are three values (autonomous) can be used and represented as:

$$\sum_{n=1}^{\infty}(x_3.Z) = b_0 \sum_{n=1}^{\infty} x_3 + b_1 \sum_{n=1}^{\infty} x_1 x_3 + b_2 \sum_{n=1}^{\infty} x_2 x_3 + b_3 \sum_{n=1}^{\infty}(x_3)x^2$$

Where b0, b1, b2 and b3 are constants; independent variables, and y values of b0, b1, b2 and b3 of the multiple regressions comparison study may be obtained resolving the following system of linear equations are constants; x1, x2 and x3 are they is the dependent variable. The multiple regressions Calculation may be acquired solving the system of linear Equations.

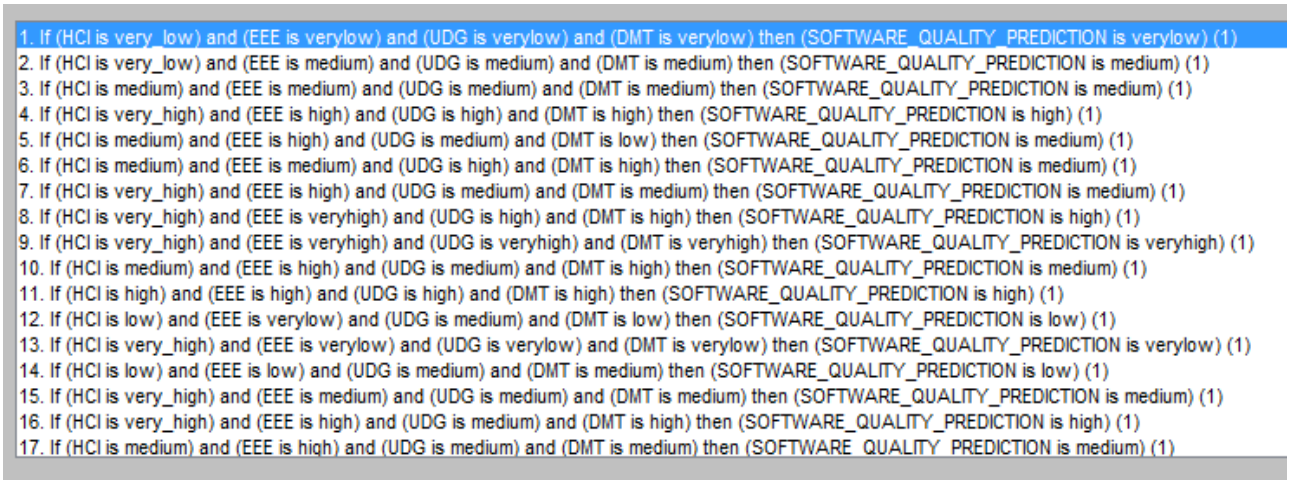

Fig 5. Fuzzy Rules Interferences of SDMQ

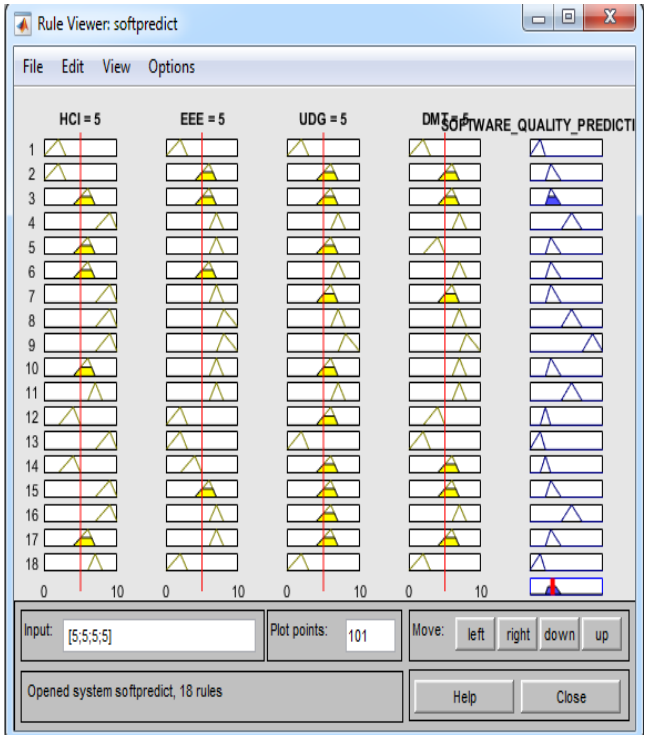

Fig.6. Fuzzy Rules Viewer of SDMQ

A complementary criterion is the prediction at level l, Pred (l) = k/N, where k is the number of observations where AEEE is less than or equal to l, and N is the total number ofvobservations. Thus, Pred (25) and Pred (5) gives the percentage of projects which were predicted with a less or equal than 0.25 and 0.05 respectively.

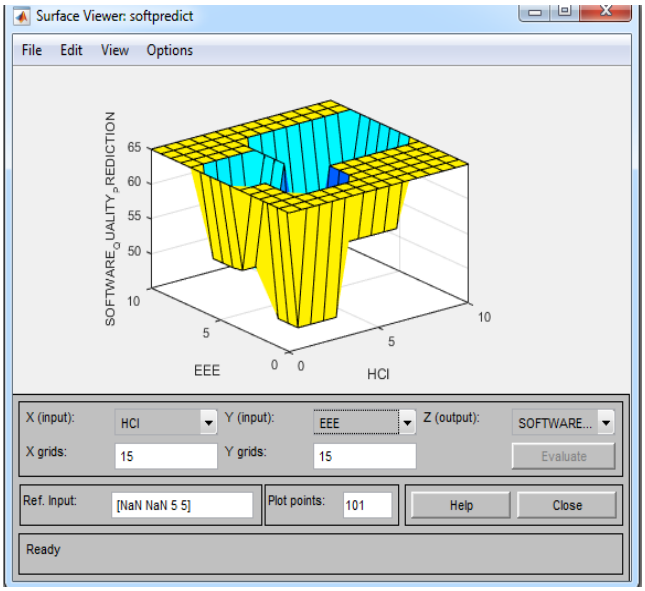

Fig.7. Fuzzy Surface Viewer of SDMQ

Where b0, b1, b2 and b3 are constants; independent variables, and y values of b0, b1, b2 and b3 of the multiple regressions Comparison study may be obtained resolving the following system of linear equations are constants; x1, x2 and x3 are they is the dependent variable. The multiple regressions Calculation may be acquired solving the following system of linear Equations

VII. CONCLUSION

This research paper had proven that the design approach practice of valuation at a individual level by not big software projects means considered the small level projects and represents the results which is acquired with a fuzzy logic system and Knowledge management prediction model. To conclude to maintain the project quality, the developer and organization wants difficult as viable software development projects and it need the application of a software development approach and software dynamics as products of system intelligent. To accomplish knowledge management defines not only to confirm that information, it utilizing the knowledge from the different quality metrics like human computer interface and evaluating the Human Computer Interface, Error Evaluation Efficiency, User Documentation and Guideline and Deployment Maintenance Software and needs to update the latest tools, techniques and continues study which is related to maintain the good quality of software projects and manage their implementation. In certain, the investigation of reasons obstructing knowledge sharing and good design buildup has to be mentioned and the conventional reasons need to be persistently excluded. This paper recommends that collecting more information to maintain the important of a specified fuzzy and knowledge management tool for software quality prediction in future too. And other explicit metric parameters would be encompassed in our imminent metrics for simplifying more precise prediction. This result illustrate that the significance of Average Error Evaluation Efficiency observed and used in fuzzy logic is lesser than Average Error Evaluation Efficiency used in another regression multiple regression; while the value of prediction is higher value that other prediction models is used before.

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