“International Journal for Science and Emerging Technologies with Latest Trends” 2(1): 1-6(2012) (ISSN NO. 2250-3641)

Fuzzy Logic Based Decision Support System for Poor Team Cohesiveness

[1]Simranjeet Kaur,
LLRIET Moga

[2] Ms. Raman Goyal
Asstt. Prof (CSE)

Abstract

This paper presents fuzzy logic based decision support system which helps to estimate the risk associated with the software development team. It is worth nothing that there are many factors that affect the quality of the software. Team risk is a major factor needs to focus for any software development organization. Team cohensiveness is a degee in which all team members work together and reach to success. We often assume that everything will go exactly, it is planned. The term “Risk” is a problem which can threaten the success of the software project. To demonstrate the effectiveness of the system ten major team risk factors are considered. These parameters are fuzzified and fuzzy rule base has been developed on the basis of the data set collected from the software experts and analyze results of the Decision support system and take important decisions for the future project.

Keywords

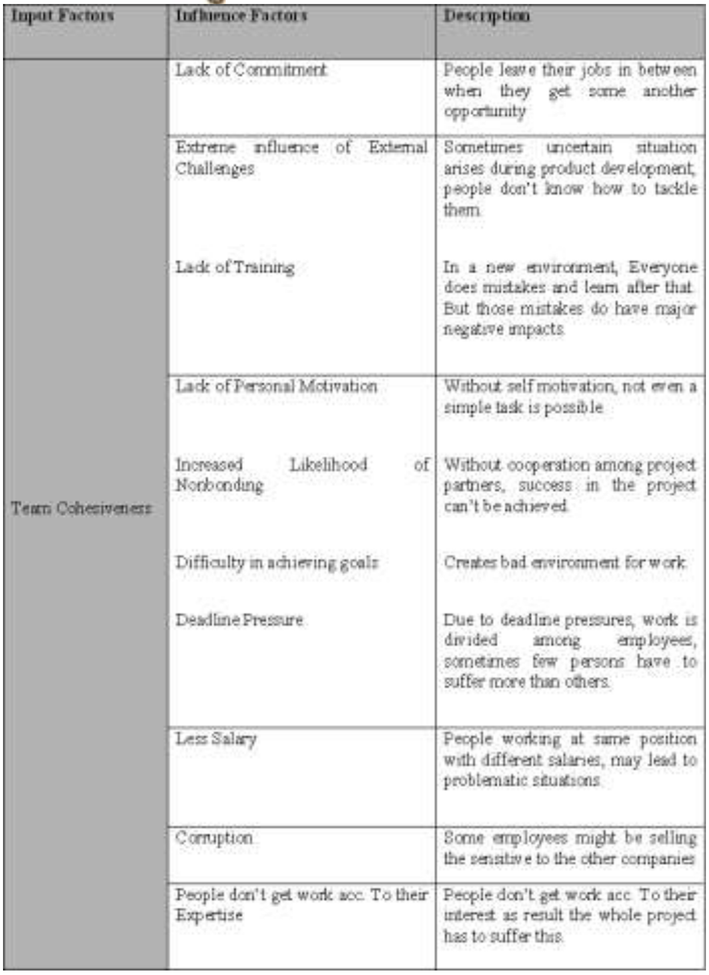
Team Cohesiveness, Team Risk, Fuzzy Logic

1.Introduction

Software engineering is a systematic, disciplined, quantifiable approach to the development, maintenance of the software product [1]. Customer always expects to have a product of high quality. There are chances of risks occurrence while creating high quality software. Risks arise due to software errors made by the programmer. The causes of software errors can be due to defining faulty requirements, communication gap between clients and developers, deliberate deviations from software requirements, logical design errors, wrong documentation, shortcoming in testing process and procedure errors. Software errors leads to software faults and finally software faults leads to software failure [2]. Risks are always uncertain. Risks do not have exact value. There is a list of evil things that always depress the software quality [3]. But, we often assume that everything will go exactly, it is planned. Man power is considered as the strong factor for the development of the software product. Fuzzy logic can be used for risk analysis since it is a tool capable of modeling data which is complex and uncertain [4].

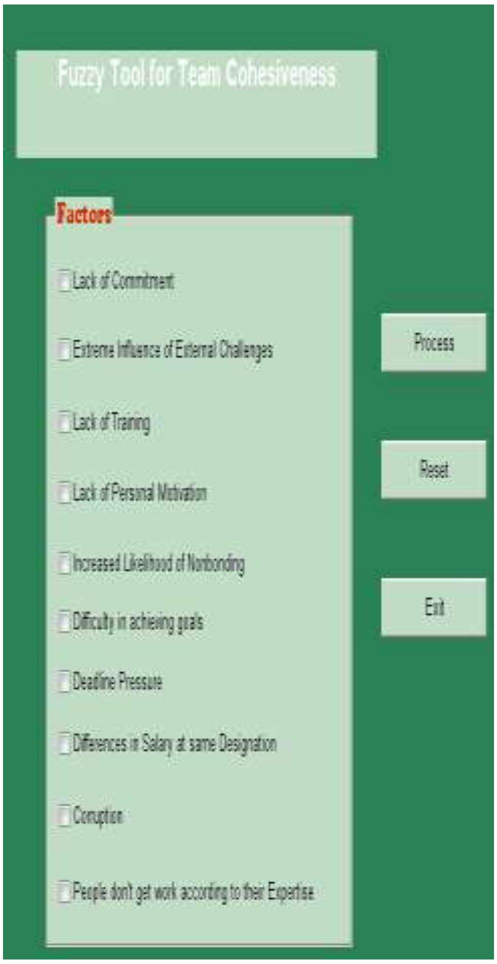
1.Team Cohesiveness

Team cohensiveness is a degee in which all team members work together and reach to success. Good team Structure easily solved the difficulties of the problem but the poor team structure unable to solve difficulities of the problem. Team Cohesion is the degree to which team members hold an attraction for each other and a desire to remain intact as a team [5]. In particular, the task oriented work of project teams have a strong impact on team cohesiveness and thus, on project team productivity and performance [6].A team can be effected by several factors like team is not committed, training lack, communication gap and many more factors leads the project to failure. The following table presents the several influenced factors of poor team cohesiveness.



Input Factors	Influence Factors	Description
Team Cohesiveness	Lack of Commitment	People leave their jobs in between when they get some another opportunity
	Extreme influence of External Challenges	Sometimes uncertain situation arises during product development, people don't know how to tackle them
	Lack of Training	In a new environment, Everyone does mistakes and learn after that. But those mistakes do have major negative impacts
	Lack of Personal Motivation	Without self motivation, not even a simple task is possible
	Increased Likelihood of Nonbonding	Without cooperation among project partners, success in the project can't be achieved
	Difficulty in achieving goals	Creates bad environment for work
	Deadline Pressure	Due to deadline pressures, work is divided among employees, sometimes few persons have to suffer more than others.
	Less Salary	People working at same position with different salaries, may lead to problematic situations
	Corruption	Some employees might be selling the sensitive to the other companies
	People don't get work acc. To their Expertise	People don't get work acc. To their interest as result the whole project has to suffer this.

Fig 1: Input factors for Team Cohesiveness



Fuzzy Tool for Team Cohesiveness

Factors

☐ Lack of Commitment

☐ Extreme Influence of External Challenges

☐ Lack of Training

☐ Lack of Personal Motivation

☐ Increased Likelihood of Nonbonding

☐ Difficulty in achieving goals

☐ Deadline Pressure

☐ Differences in Salary at same Designation

☐ Corruption

☐ People don't get work according to their Expertise

Fig 2: Team Cohesiveness Tool

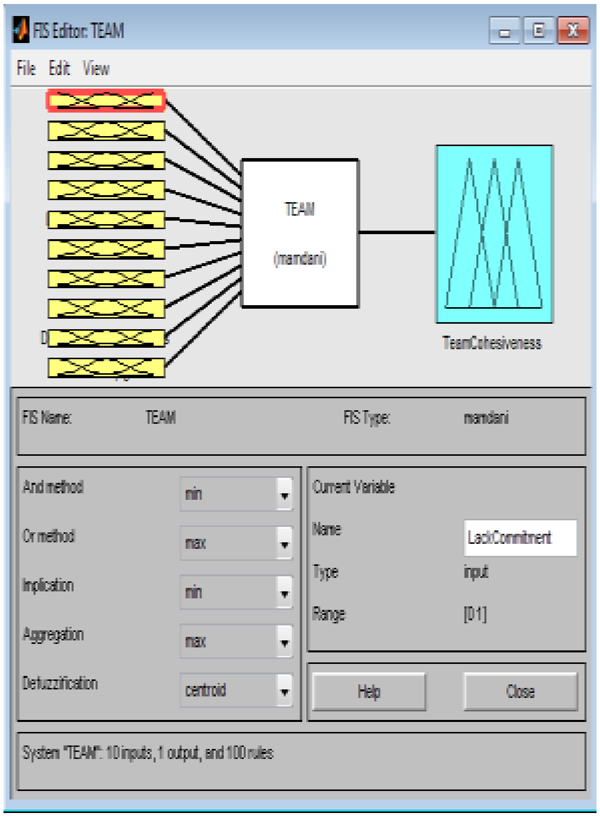
2. Fuzzy Logic

Fuzzy logic can be used for risk analysis since it is a tool capable of modeling data which is complex and uncertain [7]. Fuzzy sets were first introduced by Lukasiewicz in the 1920. After that the work on possibility theory was extended from the University of California at Berkeley written by Lotfi A. Zadeh in 1964. It was later published in The Information and Control Journal. From that time on, it has served the basis for fuzzy logic. Fuzzy logic is based upon uncertainties where there is an inherent impreciseness [8]. It provides mathematical tools for solving and working out approximate reasoning processes when having to deal with imprecise, uncertain, and vague data. This logic is composed of fuzzy sets, provides the concept of degrees of membership, which increases the number of possibilities that can be subject to research. This logic is perfect to deal with the uncertainty risk plays in a projects development. The popularity of fuzzy logic has caught the eyes of many researchers working in risk analysis [2, 3]. The nature of its modeling ensures the decision process is human like and most importantly it captures experienced expert knowledge as it is modeled around company knowledge [9]. Fuzzy logic has been used for decades to embed expert input into computer models. Many concepts can be implemented using MATLAB fuzzy logic tools. Fuzzy logic tool helps in meet new advancement of technology [10].

3. Proposed System

We constructed rule base using 100 different rules with guidance from experts including software engineers, quality managers, programmers, manufacturers, Trainers. Using MATLAB, GUI based tool is developed according to the 100 different added rules as shown in Fig 1.

Fuzzy interference system shows mapping of ten inputs and one output in Fig 3.



FIS Name: TEAM
FIS Type: mamdani

And method: min
Or method: max
Implication: min
Aggregation: max
Defuzzification: centroid

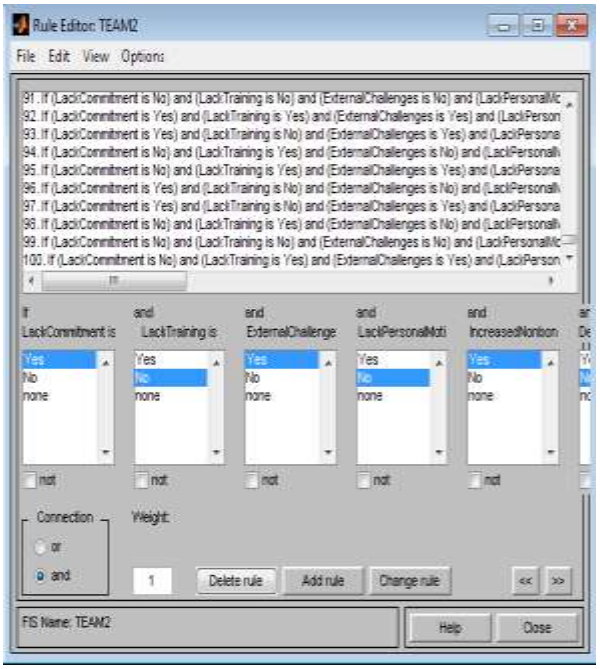
Current Variable
Name: LackCommitment
Type: input
Range: [0 1]

System "TEAM": 10 inputs, 1 output, and 100 rules

Fig 3: Fuzzy Interference System

100 rules are generated after representing inputs and output using membership functions on the basis of the data set generated with the opinion of 100 IT Managers, Quality Managers, Software Engineers, Software Trainers, and Programmers. One of the rule is- *If (LackCommitment is Yes) and (LackTraining is No) and (ExternalChallenges is Yes) and (LackPersonalMotivation is No) and (IncreasedNonbonding is Yes) and (DeadlinePressure is No) and (Corruption is Yes) and (DifficultyAchieveingGoals is No) and (Differences_in_Salary is Yes) and (DontGetWorkofExpertise is No) then (TeamCohesiveness is H) (1)*

The following figure3 shows the rule viewer where 100 rules are generated



Rule Editor: TEAM2

```
91. If (LackCommitment is No) and (LackTraining is No) and (ExternalChallenges is No) and (LackPersonalMc
92. If (LackCommitment is Yes) and (LackTraining is Yes) and (ExternalChallenges is Yes) and (LackPerson
93. If (LackCommitment is Yes) and (LackTraining is No) and (ExternalChallenges is Yes) and (LackPersona
94. If (LackCommitment is No) and (LackTraining is Yes) and (ExternalChallenges is No) and (LackPersonalN
95. If (LackCommitment is No) and (LackTraining is Yes) and (ExternalChallenges is Yes) and (LackPersona
96. If (LackCommitment is Yes) and (LackTraining is No) and (ExternalChallenges is No) and (LackPersonalN
97. If (LackCommitment is Yes) and (LackTraining is No) and (ExternalChallenges is Yes) and (LackPersona
98. If (LackCommitment is No) and (LackTraining is Yes) and (ExternalChallenges is No) and (LackPersonalN
99. If (LackCommitment is No) and (LackTraining is No) and (ExternalChallenges is No) and (LackPersonalMc
100. If (LackCommitment is No) and (LackTraining is Yes) and (ExternalChallenges is Yes) and (LackPerson
```

If LackCommitment is: Yes; and LackTraining is: No; and ExternalChallenge: Yes; and LackPersonalMoti: No; and IncreasedNonbon: Yes

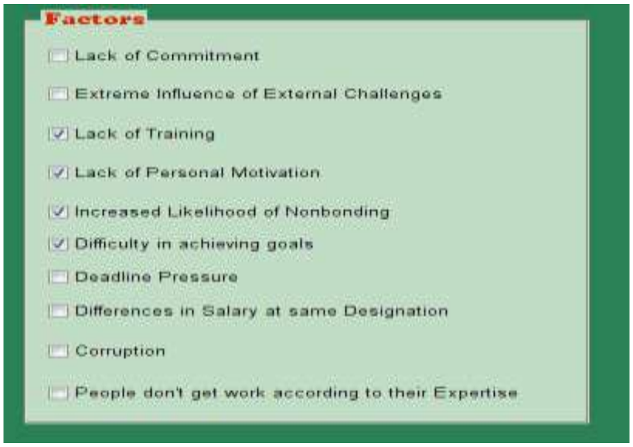
Connection: ○ or ● and

Weight: 1

FIS Name: TEAM2

Fig 4: Rule Generation

a) **Case 1:** When we consider that Lack of Training, Lack of Personal Motivation, Increased Likelihood of Nonbonding, Difficulty in achieving goals are in True state then the impact on the team cohesiveness will be 28.232%.

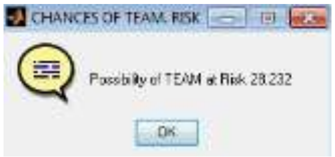


Factors

- □ Lack of Commitment
- □ Extreme Influence of External Challenges
- ☑ Lack of Training
- ☑ Lack of Personal Motivation
- ☑ Increased Likelihood of Nonbonding
- ☑ Difficulty in achieving goals
- □ Deadline Pressure
- □ Differences in Salary at same Designation
- □ Corruption
- □ People don't get work according to their Expertise

Fig 5**:** Case 1: Input Factors

Case 1: Output

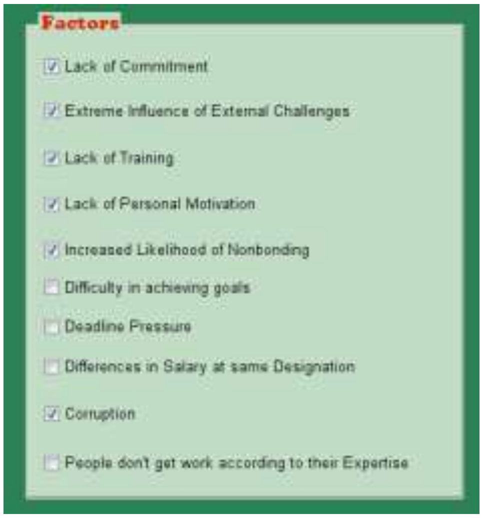


CHANCES OF TEAM RISK

Possibility of TEAM at Risk 28.232

Fig 6: Simulation results of Case 1

b) **Case 2:** When we consider that Lack of Commitment, Extreme influence of External Factors. Lack of Training, Lack of Personal Motivation, Increased Likelihood of Nonbonding are in True state then the impact on the team cohesiveness will be 50.462%.



Factors

☑ Lack of Commitment

☑ Extreme Influence of External Challenges

☑ Lack of Training

☑ Lack of Personal Motivation

☑ Increased Likelihood of Nonbonding

□ Difficulty in achieving goals

□ Deadline Pressure

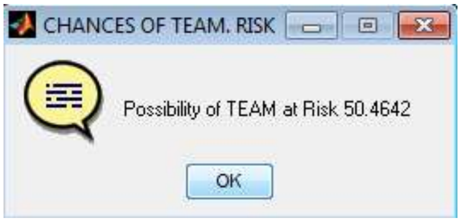
□ Differences in Salary at same Designation

☑ Corruption

□ People dont get work according to their Expertise

Fig 7: Case 2: Input Factors

Case 2: output



Possibility of TEAM at Risk 50.4642

Fig 8: Simulation results of Case 2

4. Conclusion

Team risk is a major factor needs to focus for any software development organization. In Software Engineering, researchers are still working to get the more knowledge of how risk factors can be measured and integrated into the project management process. Risk analysis is a structured mechanism to provide the visibility of threats to project success. So that negative impacts can be avoided or we can plan out how to tackle such kind of risks during the management of the development process.

5. References

[1] Boehm, B. W., "Software Engineering Economics" Prentice Hall, 1981
[2] R. N. Charette, "Software Engineering Risk Analysis and Management", New York: McGraw-Hill, 1989.
[3] B. W. Boehm, "Tutorial: Software Risk Management", IEEE Computer Society, 1989.
[4] Shradhanand, shardha, Amarjeet Kaur, uppalz, Dr. Satbir Jain , jain," Use of fuzzy logic in software development"

[5] J.S.Karn , A.J.Cowling "An Initial Study of the effect of personality on group cohesion in software engineering projects"

[6] Anita Sarma and André van der Hoek, "A Need Hierarchy for Teams" ISR Technical Report : UCI-ISR-04-9,October 2004 .

[7]A.M. Kalpana, " Fuzzy Logic Based Software Process Improvisation For Indian Small Scale Software Organizations", (IJCSE) International Journal on Computer Science and Engineering, Vol. 02, No. 03, 2010, 852-859

[8] Vishal Sharma, "Optimized Fuzzy Logic Based Framework for Effort Estimation in Software Development", IJCSI International Journal of Computer Science Issues, Vol. 7, Issue 2, No 2, March 2010

[9]Samir Shah ,"Measuring Operational Risks using Fuzzy Logic Modeling" 'Managing and Measuring Operational Risks', April 2002.

[10] G. ul-cin B.uy.uk.ozkan, "A fuzzy-logic-based decision-making approach for new product development", Int. J. Production Economics 90 (2004) 27–45