International Journal of Innovative Research and Advanced Studies (IJIRAS)
Volume 3 Issue 9, August 2016

ISSN: 2394-4404

Some Fuzzy Help-Guide Heuristics For Multi-Functional Team

EKHOLUENETALE Michael

Women's Health and Action Research Centre,
Lagos-Benin Expressway, Igue-Iheya, Benin City, Nigeria

Abstract: ***A fuzzy concept is a concept of which the content value or boundaries of application can vary according to context or conditions, instead of being fixed once and for all. Fuzzy logic is a form of many-valued logic; it deals with reasoning that is fixed or approximate rather than fixed and exact. In contrast with "crip logic", where binary sets have two-valued logic: true or false, fuzzy logic variables may have a truth value that ranges in degrees between 0 and 1. Fuzzy logic has been extended to handle the concept of partial truth, where the truth value may range between completely true or completely false.***

I. INTRODUCTION

The successful leader of a multi-functional team must have the necessary technical expertise to understand the issues and keep the team focused on the goal of the organization. Many team leaders are able to meet this requirement. However, although an understanding of the technical issues is necessary, it is not sufficient to ensure the success of the team. The successful leader is also able to understand and facilitate the human dynamics of the team; what I call providing "positive process leadership." Process leadership involve bringing together expert strangers who have not known each other, colleagues who have worked together on other tasks and enemies who have participated in some past organizational battles for the overall organizational success. The conventional method in 5organizations for multifunctional team management comprises of a set of individual with several expertise. Each expertise, work on a specific objective with the overall goal of the organization in mind. Tasks are broken down based on the specialization of each expert on board, when each expert has carried out his/her objective adequately, 6the components are merge (fused together) to get the system in an holistic manner.

Most cases experts are not readily available; also due to the fact that the ratio of tasks/expert is very high, the use of Artificial Intelligent techniques in solving the above problem will be suitable. With the involvement of Soft-computing, pattern matching, classification and detection of algorithms which have direct applications in multifunctional team management, have resulted to easy task resolutions. Hence, this project tries to find out how the fuzzy system techniques can be applied in multifunctional team

Some of the objectives, which this project work aims to achieve, are as follows:

- ✓ To simulate a fuzzy system for multifunctional team management recognition.
- ✓ To show the importance and application of artificial intelligence,

The scope of this work covers the utilization of fuzzy logic for the simulation of a system which recognizes a multifunctional team.

II. LITERATURE REVIEW

Dweiri and Kablan (2005) developed a fuzzy decision making system for the evaluation of the project management internal efficiency. The criteria used were project cost, project time, and project qualities were considered as project management internal measures of efficiency. The objective of that research was to present an approach that employs fuzzy decision making (FDM) to combine these three measures into one measure namely the project management internal efficiency (PMIE) which should represent an overall estimate of how well the project was managed and executed. The proposed approach for the evaluation of PMIE is illustrated on a case study. A fuzzy decision making system was designed and implemented using the MATLAB software for the

ISSN: 2394-4404

evaluation of the PMIE. The methodology and procedure proposed in this research may be easily implemented by project management organizations. The evaluation of PMIE can serve for project managers and for project organizations as an indicator for the level of achievement of the project management internal objectives. PMIE may help in the evaluation of the performance of project teams.

Strnad and Guid (2009) developed a fuzzy genetic system for project team optimization. In that research they discovered that the problem of optimal team formation is domestic to many areas of work organization including education, sport, and business. It is beyond manual implementation to build near optimal teams as soon as the pool of available personnel grows into several tens. The selection process itself is usually well defined — for each team they constructed the criteria relating to the required properties (i.e., capabilities) of the team members. Because these properties can be arbitrarily combined in the personnel, the objective function becomes self-conflicting. This aggravates the team formation and calls for a specialized software support.

III. SOFT COMPUTING

Soft computing is an emerging approach to computing which parallels the remarkable ability of the human mind to reason and learn in an environment of uncertainty and imprecision (Sanders, 2006). Soft Computing centres on four main areas (Neural network, Fuzzy logic, genetic algorithm and probabilistic reasoning). It is the bedrock of fuzzy logic therefore; we must understand soft computing before talking about fuzzy logic. The realization that modelling of highly complex systems, that require intelligent systems, must combine knowledge, mathematical techniques and methodologies from several sources. Intelligent systems such as Computer Generated Forces (CGF) must possess human-like expertise in the military domain. Like a human or a group of humans in a military organization they must be able to adapt and learn in a highly dynamic synthetic environment. This must be done within the constraints of doctrine, tactics, experience and performance of military systems. It seems reasonable that it would be advantageous to use several mathematical techniques together to form a hybrid system that leverages off the advantagearious modelling techniques. SOFT COMPUTING is the development of these hybrid systems that are also known as fuzzy computing. This technique uses the power of artificial neural networks that classify patterns in data and adapt that classification with highly dynamic environments. Fuzzy inference systems are an extension of classical AI techniques that incorporate human knowledge and perform uncertain reaso

- ✓ Fuzzy set theory- Imprecise reasoning using fuzzy IF-THEN-ELSE rules.

IV. FUZZY LOGIC (FL)

This is a branch of machine intelligence that helps computers paint pictures of uncertain world. Fuzzy sets were introduced by Zadeh (1965) as a means of representing and manipulating data that are not precise, but rather fuzzy. Fuzzy logic provides an inference morphology that enables appropriate human reasoning capabilities to be applied to knowledge-based systems. The theory of fuzzy logic provides a mathematical strength to capture the uncertainties associated with human cognitive processes, such as thinking and reasoning. A fuzzy set A is called trapezoidal fuzzy number with tolerance interval [a, b], left width α and right width β if its membership function has the following form:

$$A(t) = \begin{cases} 1-(a-t)/\alpha & \text{if } a-\alpha \le t \le a \\ 1 & \text{if } a \le t \le b \\ 1-(t-b)/\beta & \text{if } a \le t \le b+\beta \\ 0 & \text{otherwise} \end{cases}$$

We use the notation A = (a, b, α, β). It can easily be shown that $[A]\gamma = [a - (1 - \gamma)\,\alpha,\ b + (1 - \gamma)\,\beta]$, $\forall\, \gamma \in [0, 1]$. The support of A is $(a - \alpha, b + \beta)$.

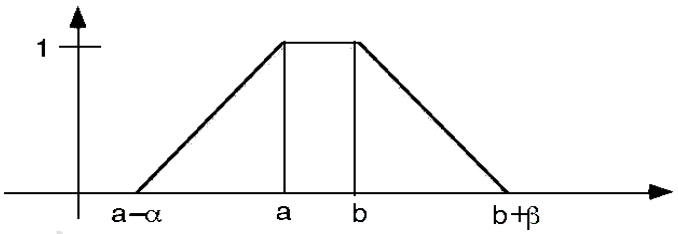

Figure 1: Trapezoidal fuzzy number

The application of fuzzy logic to the evaluation of object oriented programming languages should support a comprehensible reasoning schema that corresponds to the human reasoning process where having a logical deduction is vital and such a system needs to be self-evolving to overcome the stability—plasticity dilemma (Lin, Lee, 1996). Thus, the needs to interpret the knowledge derived from the numerical training data; support a logical reasoning schema; and be sufficiently flexible to learn new knowledge without the risk of eroding old but valid information (catastrophic forgetting) rendered most existing medical decision support systems inadequate and thus provide the motivations for this piece of work. On the other hand soft computing (Zadeh, 1994), which emulates the human style of reasoning and decision making when solving complex problems, can overcome the above mentioned deficiencies of the conventional medical decision support systems that are based on statistical models and traditional artificial intelligence (AI) techniques. The objective of the various soft computing approaches is to synthesize the human ability to tolerate and process uncertain, imprecise and incomplete information during the decision-making process. The linguistic model is essentially a fuzzy rule-base consisting of a set of IF-THEN fuzzy rules. The fuzzy rules are highly intuitive and can easily be comprehended by the human users. In addition, a neural fuzzy network can self-adjust the parameters of the fuzzy rules using learning algorithms derived from the neural paradigm. Most neural fuzzy systems proposed in the literature suffers from one or more of the following deficiencies: (1) an inconsistent rule-base (Nauck, 1997); (2) operations of the nodes are of heuristic nature or opaque; (3) a poor or weak noise tolerance capability due to the way the clusters (or fuzzy sets) are computed; (4) the stability—plasticity dilemma (Lin, Lee, 1996) where the ability to incorporate new clusters of data after training is

compromised by the risk of eroding away old (but still valid) knowledge. Thus, the system may require retraining to incorporate new information; and (5) required prior knowledge such as the number of clusters C or the number of fuzzy rules to be computed given a set of numerical training data.

V. APPLICATIONS OF FUZZY LOGIC

Fuzzy logic can be used to control household appliances such as washing machines (which senses load size and detergent concentration and adjust their wash cycles accordingly) and refrigerators.

A basic application might characterize sub-ranges of a continuous variable. For instance, a temperature measurement for anti-lock brakes might have several separate membership functions defining particular temperature ranges needed to control the brakes properly. Each function maps the same temperature value to a truth value in the 0 to 1 range. These truth values can then be used to determine how these brakes should be controlled.

In this image, cold, warm, and hot are functions mapping on a temperature scale. A point on that scale has three "truth values"- one for each of the three functions. The vertical line in the image represents a particular temperature that the three arrows (truth values) gauge. Since the red arrow points to zero, this temperature may be interpreted as "not hot". The orange arrow (pointing at 0.2) may describe it as "slightly warm" and the blue arrow (pointing at 0.8) "fairly cold"

Below are some of the areas where fuzzy logic has been used:

- ✓ Automobiles and other vehicle sub-systems, such as automatic transmissions, ABS and cruise control (e.g. Tokyo monorail)
- ✓ Air conditioners
- ✓ The massive engine used in the "Lord of the Rings" films, which helped show huge scale armies, create random, yet orderly movements.
- ✓ Cameras
- ✓ Digital image processing, such as edge detection
- ✓ Rice cookers
- ✓ Dish washers
- ✓ Elevators
- ✓ Washing machines and other home appliances
- ✓ Video Game Artificial Intelligence
- ✓ Language Filters on message boards and chat rooms for filtering out offensive texts
- ✓ Pattern recognition in remote sensing
- ✓ Fuzzy logic has also been incorporated into some microcontrollers and microprocessors, for instance, the Freescale 68HC12

VI. COMPARISON OF FUZZY LOGIC TO PROBABILITY

Fuzzy logic and probability are different ways of expressing uncertainty. While both fuzzy logic and probability theory can be used to represent subjective belief, fuzzy set theory uses the concept of fuzzy set membership (i.e., how much a variable is in a set), probability theory uses the concept of subjective probability (i.e., how probable do I think that a variable is in a set) While this distinction is mostly philosophical, the fuzzy-logic-derived possibility measure is inherently different from the probability measure, hence they are not directly equivalent. However, many statisticians are persuaded by the work of Bruno de Finetti that only one kind of mathematical uncertainty is needed and thus fuzzy logic is unnecessary. On the other hand, Bart Kosko argues that probability is a sub theory of fuzzy logic, as probability only handles one kind of uncertainty. He also claims to have proven a derivation of Bayes' theorem from the concept of fuzzy subset hood. Lotfi Zadeh argues that fuzzy logic is different in character from probability, and is not a replacement for it. He fuzzified probability to fuzzy probability and also generalized it to what is called possibility theory.

VII. HOW FUZZY LOGIC IS APPLIED

Fuzzy set theory defines fuzzy operators on fuzzy sets. The problem in applying this is that the appropriate fuzzy operator may not be known. For this reason, fuzzy logic usually uses IF-THEN rules, or constructs that are equivalent, such as fuzzy associative matrices. Rules are usually expressed in the form:

IF variable IS property THEN action OR If PROPERTY then Condition. For example, a simple temperature regulator that uses a fan might look like this:

IF temperature IS very cold THEN stop fan
IF temperature IS cold THEN turn down fan
IF temperature IS normal THEN maintain level
IF temperature IS hot THEN speed up fan

There is no "ELSE" – all of the rules are evaluated, because the temperature might be "cold" and "normal" at the same time to different degrees.

The AND, OR, and NOT operators of Boolean logic exist in fuzzy logic, usually defined as the minimum, maximum, and complement; when they are defined this way, they are called the Zadeh operators. So for the fuzzy variables x and y:

NOT x = (1 - truth(x))
x AND y = minimum(truth(x), truth(y))
x OR y = maximum(truth(x), truth(y))

There are also other operators, more linguistic in nature, called hedges that can be applied. These are generally adverbs such as "very", or "somewhat", which modify the meaning of a set using a mathematical formula.

VIII. MULTIFUNCTIONAL TEAM MANAGEMENT

Group composed of members from two or more departments or functional areas working together to solve a problem or handle a situation that requires capabilities, knowledge, and training not available from any one source. See also multidisciplinary team (BS, 2011). Multifunctional team became the standard solution for organizing product development projects. It's nowadays widely used in many successful global companies. First we will try to answer the questions, what is a multifunctional team and demonstrate how

it is implemented in companies. We then will discuss key factors influencing the efficiency of multifunctional teams. A group of individuals brought together from more than one functional area of a business to work on a problem or process, which requires the knowledge, training and capabilities across the areas to successfully complete the work. This can be the definition of Multifunctional Team. But multifunctional teams do not spring full-grown simply by assembling a group of competent individuals and calling them a team (Ralph, 2001). This is a process for building cross-functional capability in a company. It requires upgrading leadership and team-memberships. It also demands organizational culture to become more interactive and less bureaucratic. But what is different about multifunctional teams? Multifunctional teams typically comprise individuals with a functional home base (e.g. R&D, marketing, production, personnel, etc) but who work collaboratively on issues or processes requiring diverse resources. There are four key areas that distinguish multifunctional teams from more conventional teams (Hirsh and Kettley, 2000) which include; Functional diversity, competing identities Integration in the organizational structure and performance expectation. According to the research work in 'the Institute for Employment Studies', teams are usually introduced by the following reasons (Hirsh and Kettley, 2000)

- ✓ Innovation and new product/service development;
- ✓ Problem-solving across traditional organizational/functional boundaries;
- ✓ Integration of systems typically via process re-design/re-engineering;
- ✓ Coordination into a 'one stop shop' or a single point of contact or delivery.

IX. APPLICATIONS OF MULTIFUNCTIONAL TEAM IN THE INDUSTRY

Leading companies are increasingly utilizing multifunctional teams to enhance their ability to speed new, high-quality products and services to market.

"Pulling together a cross-functional team and leveraging our own expertise is one of our great strengths (IRTR, 2001). When Des Curran, 3M's 1999 "Global Ambassador of Innovation," was told to reduce the unit cost of a line of 3M respirators, instead of tweaking the manufacturing process, he reinvented the product. And by using multifunctional teams is the way in which they were able to accomplish this.

DuPont has been involved in such kind of innovation teams for the last six years through the wide-scale implementation of PACE (Product and Cycle-time Excellence) (Richard, 1996). Pace is a business-driven process for rapidly bringing robust new products to the marketplace originally developed by the consulting firm, PRTM. In PACE, the development processes are handled by a formally structured multifunctional product approval committee. The results from PACE have been significant, as it allowed many DuPont businesses to target their development resources more effectively. In addition, it allowed the company to respond more rapidly to marketplace needs. Those businesses using PACE have routinely seen an average of 30-50%improvement in cycle time.

At Motorola teams drawn from marketing, research, engineering and sales are often brought together and assigned a project. Members of these teams are first trained in creative tactics, such as associative thinking, and to work on a multifunctional team with training in the areas of conflict resolution. Motorola claims that the multifunctional teams complete assignments in less time than traditional methods with many departments involved and that the training helped to streamline the team member's efforts into creative solutions.

Ford Motor Company has also taken the multifunctional team approach towards process improvement and creation with workshops known as Ford RAPID. The program of one or two day workshops place a mixture of department individuals on teams and meet to look at a process, identify the problems and recommend solutions. Ford believes that getting people from all parts of the process together allows them to see the forest rather than just their individual trees and is key for creativity and innovation to occur (CFPT, 2001).

According to the examples above, there is strong evidence that multifunctional teams save time and money in developing new products. The diversification and decentralization of businesses, the growth of international alliances and competition, rapid advances in technology, the increasing demands of more sophisticated customers, and the dramatic reduction of product life cycles have placed greater pressure on firms to effectively manage technological innovation and organizational change. Organizations must not only improve their ability to assess, coordinate, and integrate alternative technical developments within their business strategies, they must be able as well to effectively implement those strategies through the effective management of their technical professionals. Recent reports from both the National Science Foundation and the National Research Council said that the key to the management of technological innovation is the ability to leverage the contributions of technical professionals in cross-functional teams (Hirsh and Kettley, 2000).

X. FACTORS FOR RECOGNIZING A MULTIFUNCTIONAL TEAM

The following factors are essential for recognizing a multifunctional team (Xin, 2002)

MEMBERS WITH SPECIFIC SPECIALIZATION

An effective multifunctional team involves experts with specific specialization. Setting goals is, of course, important to the success of any team. However, it appears to be especially critical to the success of multi-functional teams for specialized members to been involved. In addition to the typical reasons (provides direction, creates a scoreboard) for having team goals, specialization of multifunctional teams help resolve conflicts among members and obtain needed resources from important stakeholders. While conflicts among professionals are inevitable on interdisciplinary teams, most can be resolved if the team have clear defined or agreed on a clear goal.

MEMBERS WHO ARE FLEXIBLE

Flexibility is another key characteristic of an effective multi-functional team. A rigid, highly structured person who likes lots of clear rules and regulations will have great difficulty in this environment. Multi-functional teams operate in a fluid, changing arena. As hard as we try to clarify authority, establish policies, and publish manuals, the day-to-day functioning of the team will be changeable. As a team member, you must be prepared to react and adapt with ease. A team member must have an ability to deal with some ambiguity and respond when the real-world situation differs from your initial assumptions.

MEMBERS WHO CAN RESOLVE CONFLICTS

We assume there will be some conflict on a multi-functional team. In fact, it is a given; the diversity of ideas, expertise, and styles is the very strength of a multi-disciplinary team. Members need therefore to understand that conflict is not bad and that disagreements on the team are to be expected. Viewed from a different perspective; if there is total agreement throughout the life of the team, something is wrong. Either we don't have a diverse membership or the diversity exists but is being suppressed or smoothed over.

An effective multifunctional team thus encourages the expression of opinion

- ✓ helps the team look at both sides of issues,
- ✓ forms subgroups to study problems,
- ✓ keeps the team goals and the patient or customer in view
- ✓ Uses the consensus method to make key team decisions.

However, beyond the internal dynamics issues such as goal setting, conflict resolution, and empowerment, the effective leader must also address a series of external factors.

MEMBERS WHO CAN OBTAIN RESOURCES

The effective member of a multi-disciplinary or Multi-functional team is more often than not able to "simply get the team what they need, when they need it." The needs of team members vary widely from laboratory time or computer support to less tangible items such as fast turnarounds on approvals or freeing up of team members. Effective team members have to be tenacious and they must be willing to make noise at the top and ask embarrassing questions when obstacles arise

MEMBERS WHO CAN MAINTAIN GOOD STAKEHOLDER RELATIONSHIPS

It is virtually impossible for a multi-functional team to be exclusively focused on the internal operation. Even with the best technical work and group process, the team will fail if members are unable to work effectively with others key stakeholders outside the team (Directors of functional departments, upper management, regulatory bodies, patients etc). The team members are often the key facilitator of the interactions with the team's stakeholders. This function requires good communications skills such as listening, negotiating, and resolving conflict.

MEMBERS WHO CAN ORCHESTRATE COMMUNICATIONS

Multi-functional team members need to know that management supports them; therefore, they want to get regular feedback from the management sponsors of the team. Because it is often difficult to get top managers to come to team meetings, the team member has to communicate with these managers about the team's work, get their reactions, and report back to the team. On the other hand, when the team simply wants to be left alone. The effective team leader provides upper management and other stakeholders with enough information to satisfy their curiosity and keep the team insulated.

DEVELOPMENT OF TEAM MEMBERSHIP

The challenge for many organizations is how to develop existing team leaders. More specifically, how do you take a talented surgeon, a skilled researcher or an experienced engineer and turn him or her into a person capable of effectively leading a multi-disciplinary team. They have the technical or scientific skills but lack the process leadership necessary for successful team leadership. There are a number of possibilities.

- ✓ Co-leadership. Co membership is an approach being tried in a number of organizations. When there is a natural division of responsibility, this approach makes sense. One division of membership roles that seems to work is the splitting of technical and process membership functions. In this model, the expert-leader (for example, an engineer or physician) focuses on the task while the facilitator-leader, with group dynamics and team management experience, addresses the team meeting and other process issues.
- ✓ Coaching support. Some organizations provide the team member with a trained professional to coach the team leader. In this model, there is one team leader, usually a technical or scientific expert, backed up by a human resources staff person or other professional with good group coaching skills. The coach helps the team leader adjust his or her style to make effective use of team resources, offers advice and coaching on dealing with difficult interpersonal issues, and provides feedback to the leader on an ongoing basis.
- ✓ Rotation of team member. This model applies to some long term projects that have a series of key phases. The member changes as the project moves into a new phase, with the member coming from the function that is carrying the ball during the particular phase. As a result, the member is the person most knowledgeable about the current work of the team. In another variation, the formal leader (eg, Chief-Surgeon, Senior Clinician) may ask another team member (eg, assistant surgeon, clinical trial leader) to lead the team for a specified period of time as a development opportunity for that person.
- ✓ Membership training. This approach simply says that every multi-functional team leader needs solid leadership training. The training tends to be focused on the group process aspects of the position because these skills are

usually the most poorly developed. The curriculum should include topics such as:

- Developing an effective team leadership style
- Improving listening and other communication skills
- Resolving conflicts constructively
- Creating open c
- Providing performance improvement feedback
- Planning and managing team meetings
- Facilitating effective relationships with stakeholders
- Recognizing and motivating team members

MEMBER OF DIFFERENT AGE GAP

While it is necessary for advancing age to provide necessary or required experience, Young age person are also play a pivoted role in bringing in new innovation not recognized due to aging. There must be balance between age gaps for the overall goals of the organization to be realized.

MEMBERS WITH GOOD HEALTH

The health state of each member is necessary for the overall achievement of organizational objectives. How an ailing individual can put in his/her best in other the set objectives? Good health is a focused point of multifunctional team management.

ORGANIZATIONAL TASK MUST BEEN BROKE DOWN

Organizational task must be broke down into constituent parts for it's to be fully effective. If organization task are not broke down, it objective will not be fully actualized in due time.

NO PREFERENTIAL TREATMENT FOR ANY MEMBER

All members must be treated equally. Equal task, equal objective and equal resources. Other while specified by organization leaders and necessary for overall fulfilment of objectives.

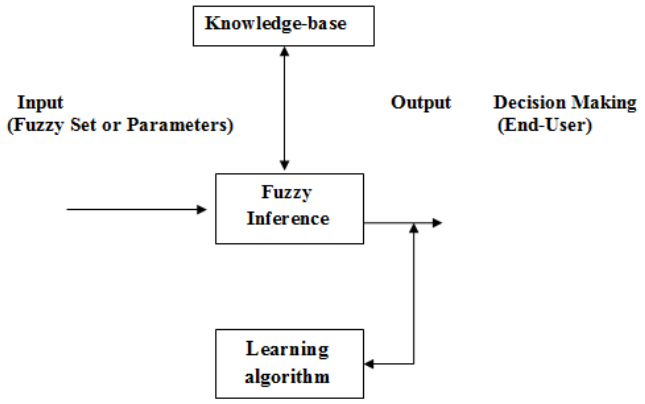

Figure 3.1: Model of the proposed fuzzy system for the Multifunctional recognition

In this work, we also propose a system in order to further group/classify the data input for ease of inference; this system is known as the "Fuzzy Classifiers System"

XI. DESIGN OF THE PROPOSED FUZZY SYSTEM

To design a fuzzy system for the recognition of multifunctional team, a set of parameters (criteria's) are collated and inputted into the system which are to be used for the recognition. The basic parameters (eleven (11) in this case) are listed below:

- ✓ Members with Specific Specialization
- ✓ Members who are flexible
- ✓ Members who can resolve conflicts
- ✓ Members who can obtain resources
- ✓ Members who can maintain good stakeholder relationships
- ✓ Members who can orchestrate communications
- ✓ Development of team membership
- ✓ Member of different age gap
- ✓ Members with good health
- ✓ Organizational task must been broken down
- ✓ No preferential treatment for any Member

The operation procedure of the model is represented in the figure 3.2 below. The above parameters are fed into the fuzzy system with the organization leader expected to choose from the available list of parameters the one related to what his/her possess.

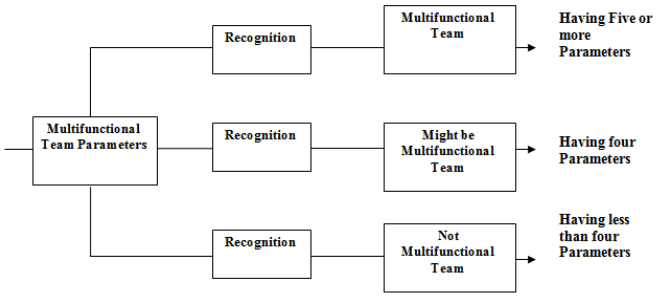

Figure 3.2: Operational Procedure of the Fuzzy System for the Recognition of a Multifunctional team

XII. FUZZY CLASSIFICATION

The fuzzy partition for each input feature consists of the clinical symptoms of Tuberculosis (members with Specific Specialization, members who are flexible, members who can resolve conflicts, members who can obtain resources, members who can maintain good stakeholder relationships, members who can orchestrate communications, development of team membership, member of different age gap, members with good health, organizational task must been broke down, no preferential treatment for any Member). However, it can occur that if the fuzzy partition of TB is not set up correctly, or if the number of linguistic terms for the input features is not large enough, then some patterns will be misclassified. The rules that can be generated from the initial fuzzy partitions of the classification of TB is thus

- ✓ Multifunctional team (C1)
- ✓ Might be multifunctional team (C2)
- ✓ Not Multifunctional team (C3)

If the organizations is having five or more organizational parameters (C1), having four organizational parameters (C2)

ISSN: 2394-4404

and if the patients is having less than four organizational Parameters (C3).

The Fuzzy IF-THEN Rules (R_i) for Multifunctional team is

R1: IF the organization, is having members with specific specialization THEN he/she has class C3.

R2: IF the organization is having members with specific specialization and Members who are flexible THEN he/she has class C3.

R3: IF the organization is having members with specific specialization, members who are flexible and members who can resolve conflicts THEN he/she has class C3.

R4: IF the organization is having members with specific specialization, members who are flexible, members who can resolve conflicts and members who can obtain resources THEN he/she has class C2.

R5: IF the organization is having members with specific specialization, members who are flexible, members who can resolve conflicts, members who can obtain resources and members who can maintain good stakeholder relationships THEN he/she has class C1.

R6: IF the organization is having members with specific specialization, members who are flexible, members who can resolve conflicts, members who can obtain resources, members who can maintain good stakeholder relationships and members who can orchestrate communications THEN he/she has class C1.

R7: IF the organization is having members with specific specialization, members who are flexible, members who can resolve conflicts, members who can obtain resources, members who can maintain good stakeholder relationships, members who can orchestrate communications and development of team membership THEN he/she has class C1.

R8: IF the organization is having members with specific specialization, members who are flexible, members who can resolve conflicts, members who can obtain resources, members who can maintain good stakeholder relationships, members who can orchestrate communications, development of team membership and member of different age gap THEN he/she has class C1.

R9: IF the organization is having members with specific specialization, members who are flexible, members who can resolve conflicts, members who can obtain resources, members who can maintain good stakeholder relationships, members who can orchestrate communications, development of team membership, member of different age gap and members with good health THEN he/she has class C1.

R10: IF the organization is having members with specific specialization, members who are flexible, members who can resolve conflicts, members who can obtain resources, members who can maintain good stakeholder relationships, members who can orchestrate communications, development of team membership, member of different age gap and members with good health THEN he/she has C1.

R11: IF the organization is having members with specific specialization, members who are flexible, members who can resolve conflicts, members who can obtain resources, members who can maintain good stakeholder relationships, members who can orchestrate communications, development of team membership, member of different age gap, organizational task must been broke down, members with good health, organizational task must been broke down and no preferential treatment for any member THEN he/she has C1.

PARAMETERS (FUZZY SET OR CRITERIAS)	CODE	DEGREE OF MEMBERSHIP OF MULTIFUNCTIONAL TEAM		
		CLUSTER 1 (C_1)	CLUSTER 2 (C_2)	CLUSTER 3 (C_3)
Members with specific specialization	P01	0.50	0.40	0.10
Members who are flexible	P02	0.50	0.10	0.40
Members who can resolve conflicts	P03	0.40	0.55	0.05
Members who can obtain resources	P04	0.10	0.60	0.30
Members who can maintain good stakeholder relationships	P05	0.62	0.28	0.10
Members who can orchestrate communications	P06	0.05	0.80	0.15
Development of team membership	P07	0.10	0.13	0.77
Member of different age gap	P08	0.80	0.10	0.10
Members with good health	P09	0.20	0.69	0.11
organizational task must been broke down	P10	0.51	0.39	0.10
No preferential treatment for any member	P11	0.66	0.10	0.24
RESULTS		**Multifunctional Team**	**Might be multifunctional Team**	**Not Multifunctional Team**

Table 1: Degree of membership of Multifunctional team Parameters Scale (0.00 -1.00)

The degree of membership of Multifunctional parameters order in the following classes for a typical scenario is presented in Table 1. From Cluster 1, represent possible situation of *"multifunctional team"* because at least five of the parameters are pronounced. In cluster 2, there *"might be multifunctional team"* since only four of the parameters are pronounced. Cluster 3 *"Not multifunctional"* since only a parameter of multifunctional team is pronounced.

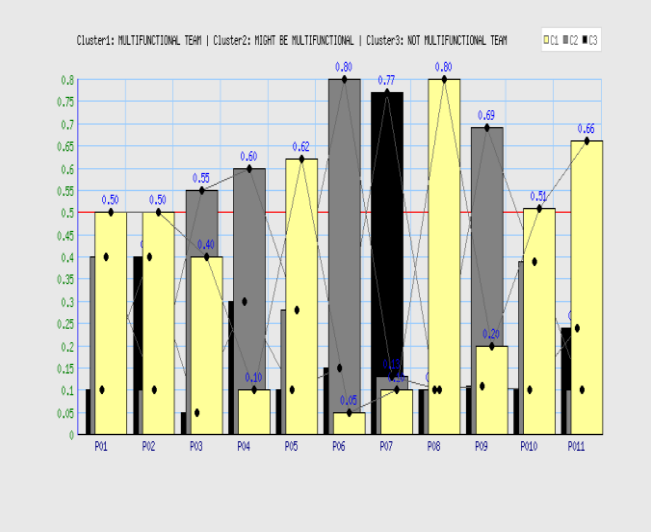

Figure 3.3: Graphical representation of Membership Grades of Multifunctional team

The graphical representation in Figure 3.2, is a representation of Table 1 and clearly show six parameters with high degree of "Multifunctional team" in Cluster 1, four parameters with high degree of "Might be multifunctional team" in Cluster 2 and a parameter with high degree of "Not multifunctional team" in Cluster 3.

XIII. SUMMARY

The basis of this project was to design a fuzzy system for the recognition of multifunctional team. In the course of this study the basic concepts of fuzzy were discussed such as fuzzy logic and fuzzy classifier and multifunctional team. Other concepts such as fuzzy cluster means were also learnt to get a thorough understanding of this project.

Results obtained from the system were satisfactory and hence, the system can further be configured to recognise any multifunctional team. The system however was implemented using the PHP and MYSOL.

XIV. CONCLUSION

In this project however, we offer a computerized system to assist organizational leader in recognizing multifunctional team. This advanced system which uses a set of fuzzified data set is more precise than the traditional system.

XV. RECOMMENDATION

Due to the large organizational task in most organization, a multifunctional approach is necessary in solving organizational problems. This system has the ability to recognise a multifunctional team base on the input parameters given to it.

Also neural network show been fused with fuzzy logic for a more advanced neuro-fuzzy systems can however be designed to bring about the self-learning ability.

REFERENCES

[1] BS; Business dictionary, (2011), "Functional Team" retrieved from http://www.businessdictionary.com/definition/multifunctional-team.html
[2] CFPT: Cross Functional Project Teams (2001), "MFTM" retrieved from thebesemer.com/ currentmarketplace.html. #crossfunctional.html
[3] Dweiri F.T. and Kablan M.M. (2005), "Using fuzzy decision making for the evaluation of the project management internal efficiency" retrieved from http://www.sciencedirect.com/science/article/pii/S0167923605000618
[4] Hirsh W and Kettley P. (2000), "Learning from Cross-functional Teamwork", IES Report 356, October 2000, ISBN 1-85184-285-
[5] Innovator Reinvents the Respirator (2001), "PTMS" retrieved from www.3m.com/abou3m/innovation/curran/index.jhtml
[6] Nauck D. F. Klawonn, Rudolf Kruse (1997)," Foundations on Neuro-Fuzzy Systems", retrievedhttp://books.google.com.pe/books/about/Foundations_of_neuro_fuzzy_systems.html?hl=en&id=lcVQAAAAMAAJ
[7] Ralph K. (2001), The Human Side of Managing Technological Innovation, web.cba.neu.edu/alumni/breport/1997/rkatz.html, 24.12.2001
[8] Sanders Jan A (2006): Averaging. Scholarpedia, 1(11):1760.
[9] Strnad D. and Guid N. (2009), "A fuzzy-genetic decision support system for project team formation" retrieved from http://www.sciencedirect.com/science/article/pii/S1568494609001471
[10] Richard H. (1996), "Tait", the Sponsorship Process to Strengthen Innovation", #247 R&D Innovator Volume 5, Number 11
[11] Xin S. (2002), "Factors Affecting Multifunctional Teams in Innovation Processes" IPM-Master Student, Northern Institute of Technology
[12] Zadeh, L., A., 1965. "Fuzzy sets and systems", In: Fox J, editor, System Theory. Brooklyn, NY: Polytechnic Press, 1965: 29–39.

APPENDIX A (INTERFACES)