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# Development of ANFIS-FMM Model for time evaluation of work activities under Green HRM Practices on Employees Sustainability for Productivity and Work Culture in Steel Industries of Chhattisgarh

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**Abstract**

There is an increasing need for combining environmental management into Human Resource Management (HRM) which the experts termed as “Green HRM”. It is the research practice and Sustainability for any steel industry focuses on its existence in relation to economic and social sustainability of the firm. It is essential for steel industry to ensure that, recent business goals have made without compromising the ability of future generations for meeting their own needs. To attain the same, ‘Green HRM’ is emerging as a recent initiative that promotes environment concerned Human Resources practices. Through Green Human Resources practices, industries seek to produce the environmental awareness and commitment for greener world, among employees and society. The Greening of Human Resource policies include methods of environmentally friendly "green" initiatives that steel industries are utilizing, involving their workforce and human resource practices.

This paper explores the problem of defining the number of required employees and their skills, as well as optimizing the work time in sustainable environmental situations. Almost every job set for the management must be performed properly and reliably in changeable environmental conditions. The idea of the paper was to develop a model for green human resource allocation (GHRA) in Neuro-fuzzy environment using ANFIS. To solve the problem, the following approaches are used: Fuzzy logic, Neural network and Simulated annealing. The model for GHRA is based on an adaptive neuro-fuzzy inference system (ANFIS) and fuzzy mathematical model (FMM) for treating uncertainty. ANFIS-FMM model enables the human resource strategy development based on the optimization of the employees’ work time. In this ANFIS-FMM model the input variables are described using fuzzy sets represented by Gaussian functions. Using expert reasoning, an unique knowledge base is formed which enables the human resource strategy development based on the optimization of the employees’ work time. In this paper the model for

GHRA is developed based on adaptive neuro-fuzzy technique application and FMM. The model has four main advantages over other GHRA methods: the system possesses adaptability, the model is efficient in conditions of uncertainty, the neuro-fuzzy based GHRA model allows dynamic decision making in GHRA management through the implementation of a computer-based system, it can be IT-supported tool.

**Keywords:**

ANFIS Model, Simulated annealing, Green HRM, Sustainability, Greening, Steel industries**.** Organizational sustainability; Green organizational behaviors

## 1. Introduction

In today's rapidly converting globalized business world, sustainability for a business enterprise specializes in organizational existence in terms of monetary, ecological, and social sustainability. Researchers have opined that businesses have to be aware of social and environmental elements along with budget friendly and financial factors so that you can sustain and live on (Govindarajulu & Daily 2004). Daily and Huang (2001) also opined that organizations essentially need to stability the commercial boom and ensuring that the environment in which one lives is nicely preserved and promoted. Green HRM is the concept which promotes sustainable practices via growing employees' awareness and commitments on sustainability. It entails adopting and implementing environment-pleasant HR projects, a good way to attain extra efficiencies, and better employee engagement, which in flip, help agencies to reduce worker carbon footprints.

The green control may additionally result in a company's stronger operational overall performance (Jackson et al., 2012), greater teamwork (Jabbour et al., 2010), advanced organizational lifestyle (Jabbour et al., 2012) and reduced cost (Hart 1997). HR practices, being implemented in line with the lifestyle and enterprise approach, need to make a contribution in the direction of organizational performance (Boselie et al, 2001). Thinking about this, researchers supply importance to adoption of environmental practices as a key goal of organizational functioning making it important to discover with the help of human resource management practices (Jackson et.al., 2011; Daily and Hung, 2001; Sarkis et al., 2010). since inexperienced HRM goals to combine HRM methods with organizational techniques of sustainability, it may encompass strict recruitment techniques (Grolleau et al., 2012), appraisal and praise structures linked with the environmental focus and implementation of their assessment method (Jabbour et al,.2012) and training and empowerment programs (Unnikrishnan and Hedge 2007), so that you can enable the development of recent set of competencies and abilities among the personnel of "seasoned-inexperienced" companies (Cherian & Jacob, 2012).

Environmental Sustainability: Sustainability is frequently defined because the "capability to fulfill the needs of the existing without compromising the capacity of future generations to satisfy

their needs (WCED, 1987 as mentioned in Cohen Toylor & Muller, 2004). Within the environmental literature, the concept of green control for sustainable development has diverse definitions; all of which commonly, are seeking for to explain the need for balance among business increase for wealth creation and safeguarding the natural environment so that the destiny generations may thrive (Daily & Huang, 2001). Despite the fact that, the problem of ways an individual company or whole society achieves sustainability from the green human useful resource control motion remains arguable and doubtful. As a result, research on how enterprise may additionally shape their centers to beautify for sustainability through green human aid control projects seems paramount.

The issue of sustainability became a mainstream topic soon after the publication of the United Nations' Brundtland Report (also known as Our Common Future) in the late 1980s. The report addressed the issue of the need for sustainable development (p. 41), which is "a development that meets the needs of the present without compromising the ability of future generations to meet their own needs". This definition has been the basis for the development of the concept of organizational sustainability. Organizational sustainability (otherwise known as corporate sustainability), since this issue has been mostly tackled among for-profit organizations, is a broad concept, addressing not only ecological concerns, but also social responsibility and the integration of economic activities with the concern about both the natural and the social environment. 'Greening' an organization has an impact on how it deals with its supply chain; the production process; the waste management and production; the organizational culture; and its values, strategies, choices and employee behaviors, just to mention a few examples.

In the last two decades, the mainstream nature of sustainability and environmental awareness pushed both practitioners and academics to address the issue of human resource management as a strategic tool for greening an organization and, in turn, economics and society at large. In fact, as Wehrmeyer observed: "if a company is to adopt an environmentally-aware approach to its activities, the employees are the key to its success or failure".This explains the rise of a new concept: the green human resource management (GHRM).

In fact, under the wide umbrella of the studies on GHRM, there is everything that relates to awareness, adoption and implementation of HR practices, which have an impact on sustainability. More precisely, GHRM covers all the practices that contribute to an organization's economic, environmental, and social (this last one being in terms of employee safety, health, equity, and wellness) sustainability dimensions from the perspective of employees, in the light of the corporate sustainability requirements.

Human resource management plays a pivotal role in greening organizational policies and practices at the very heart of an organization's sustainability through recruitment, selection, training, development, performance appraisal, rewards, compensation management, and exit policies, as wellas in communicating values and corporate culture. GHRM was originally considered as the HRM facet of environmental management (EM), and, for this reason, at the beginning of its development, it was observed merely in relation to the managerial strategic choices and the practices of the human resource departments. Later, other authors developed a broader approach, underlining the relevance of the proactive role played by employees' behaviors, attitudes, and commitment to achieve EM, as shaped and promoted through GHRM. As a result, the exact definition of GHRM is still debated, though much more attention is devoted to the GHRM practices and their actual outcomes. GHRM practices are mostly analyzed in the light of the AMO (ability, motivation, opportunity) theory and the social identity theory. According to the AMO theory, performance is a result of the interaction of employees' capacity to perform (ability), willingness to perform (motivation), and opportunity to perform through participation (opportunity). Therefore, applying the AMO theory to GHRM practices implies: identifying and developing employees' green competencies; creating a system of green performance appraisal and green rewards that generate green motivation; offering employees ways to operate with flexibility at work, autonomy, and participation in decision making, aimed at increasing employee green behaviors in the workplace.

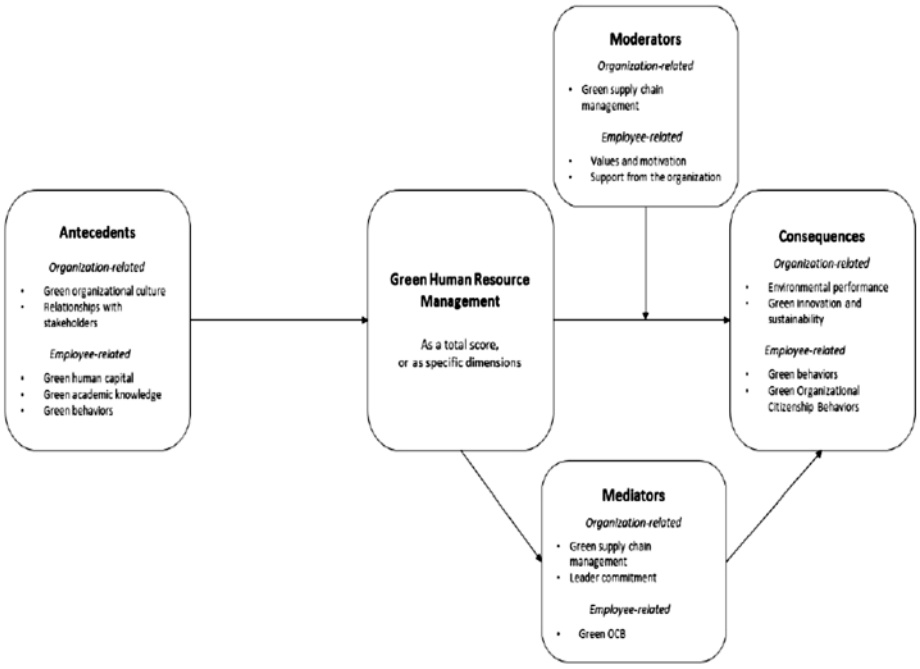


**Fig.1** Synthesis of the main antecedents and consequences of GHRM and its main mediators and Moderators

The latest and most extensive review was carried out by Amrutha and Geetha. They covered a wider range of years, from 1995 to 2019, confirming the lack of studies carried out in undeveloped countries, while finding that the majority of studies were carried out in Europe and Asia. Based on their findings, they developed a model aimed at explaining how GHRM practices have an impact on organizational sustainability (in its three facets: environmental sustainability, social sustainability, and economic sustainability) through the mediation of employees' green behaviors at work. Each of these three factors interacts with the corporate social responsibility as well as with contextual factors. Figure 1 shows a graphical synthesis of the main organization and employee-related antecedents and consequences, with main mediators and moderators.

Human resource management (HRM) has a crucial importance in the business efficiency of a company. Only with proper strategic and tactical green human resource allocation (GHRA), can a company be successful and progressive. Managing the available green human resources should be determined by the company's strategic planning of resource allocation. Adequate resource management allows for the future goals and objectives of the company to be achieved. On the other hand, but not less important, dynamic HRA becomes crucially important today when the business world is rapidly changing.

In this paper the model for GHRA of a company, based on certain fuzzy logical production rules, is presented. The fuzzy rule base enables the management of human resource portfolio in fuzzy environment. The authors present a universal model for GHRA, based on the Adaptive Neuro-Fuzzy Inference System (ANFIS) and a fuzzy mathematical model (FMM) for Green HRA. ANFIS-FMM model enables the human resource strategy development based on the optimization of the employees' work time. In changeable environment, the model helps decision makers in the process of evaluation and assessment of a company employees' potential.

In the ANFIS-FMM model inputs (expertise, equipment of the workplace, motivation, and work experience) are described by fuzzy sets that are presented by Gaussian membership functions. Based on experts' opinion, the unique knowledge base has been developed that enables the optimization of the time for performing the activity. The optimized time is the input for the FMM for GHRA. The output of the ANFIS-FMM model is the required time for activities by qualifications of the human resources of the company. The proposed approach allows researchers a flexible GHRA in accordance with environmental changes and it provides reasonable solutions in the context of intelligence systems.

## 2. Parameters of Green HRM

**Green Employer:**

Organization should recruit green employer or employees who are aware about green environment and green HR practices. Management should recruit them at right time and at right place. By recruiting green employer, which may improve employer branding as well as staff motivation, employee engagement, increases workforce and reduces employee turnover.

**Green Team:**

Creating green teams among employees will helps to identify green issues and also it provides specific solutions for the problems, this makes organization to operate more environmentally sustainable. Such teams will educate, inspire and empower employees regarding green environment and green issues.

**Selection:**

Management should adopt E- selection for hiring employees. It will reduce usage of carbon foot prints and also reduces cost & time. Management should conduct green orientation programs for newly hired employees; this will create environmental awareness among newly hired employees.

**E- Performance Management:**

For measuring environmental performance of employees organizations should use E-performance management system and E- HR system for tracking out carbon emission done by both management and employees.

**Online Training Programs:**

Management should provide online training and development programmes for employees regarding environmental and social issues such as waste management, elimination of plastics, creating green products, reducing carbon emission etc.

## 3. Proposed Model for GHRA

Determining the time required to perform certain activities is based on the systematic approach to dimensioning of organizational structures. The systematic approach involves determining the functions, duties and qualifications of the organizational structure bodies and defining the model for determining the time of performing activities. To determine the time of performing the activities, an approach to evaluating and recording the time of work in the organizational structures is used. The obtained times are largely based on experience, intuition and subjective assessment. Considering that there is a degree of uncertainty and fuzziness about the

times obtained, the theory of fuzzy sets is the most suitable mathematical tool. Since in the process of data collection there is a degree of uncertainty and fuzziness of the times obtained, the times are viewed as fuzzy numbers (Badi & Ballem, 2018). In this paper, the times required for the execution of the activities are obtained using the fuzzy-mathematical model derived on the basis of the resource allocation model (Figure 2).

The basic principles of this model are that, starting from the goals set, the complexity of business that must be done at different levels of organizational structure are defined, in order to achieve the goals set. By the development and analysis of these sets of jobs, the time required for the execution of a certain activity is determined. The procedure is carried out through the following stages:

• defining the functions of organizational structure,

• dividing functions into jobs,

• decomposing the jobs into activities, as specific activities of direct employees,

• defining required qualifications of employees and the levels at which the jobs are performed, and

• Variations of determining the time for the execution of activities by qualifications of employees.

It is particularly important to decompose the jobs into partial tasks – activities and define the employee's and the time for carrying out each of these activities. In order to predict all relevant activities within a job, it is necessary to be well acquainted with the technology of their execution. For each activity, it should be defined who will or who can do it (profiles of workers), at what level and how many resources will be engaged (time, number of people, etc.). To establish the duties and activities of the organizational structure, as well as the time needed for their execution, it is possible to use the survey method, interviews, recording method and other methods.

Using the rules of fuzzy arithmetic, a model was developed for determining the time required for performing a certain activity or job by qualifications which are represented as triangular fuzzy numbers. In terms of the time obtained by recording, there is a large degree of uncertainty, but we assume that it will not be longer than $t_1$ or less than $t_2$. In other words, we are sure that the time of performance belongs to the closed interval T=[ $t_1$, $t_2$], which is called the confidence interval (Petrovic & Kankaras, 2018). In addition to confidence interval, triangular fuzzy number, in our case, fuzzy time, is also characterized by the degree of belief. The concept on the basis of which the fuzzy number is expressed using confidence interval and corresponding degrees of belief was proposed by Sremac et al. (2018).

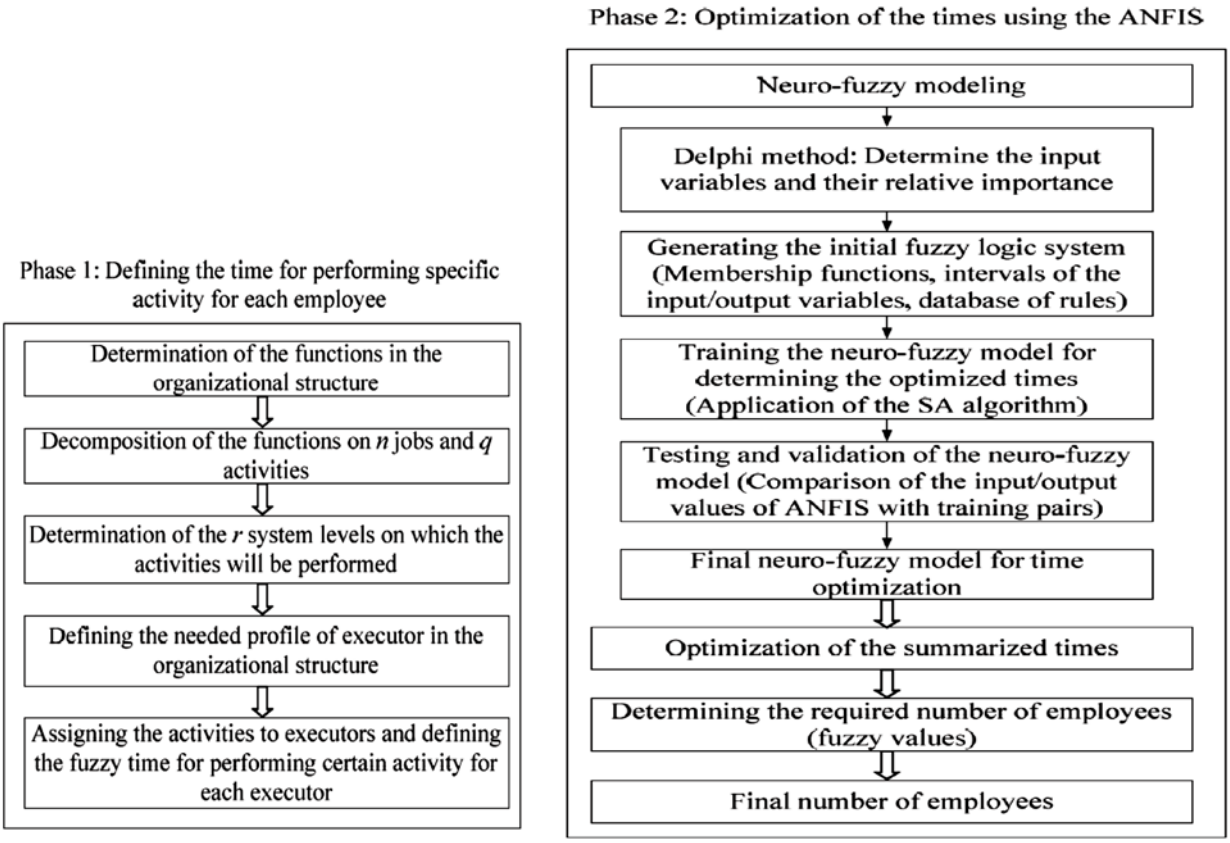


Fig.2 Model for designing the organizational structure

### 3.1. Configuration of the ANFIS

The times obtained for each qualification are optimized by applying a fuzzy logic system. For the optimization of performance time, four criteria are defined that determine the value of time more accurately and that can contribute to reducing or increasing the total time spent on performing activities by each qualification. The mentioned criteria are:

− Expertise of the employee scheduled to perform certain activity,
− Equipment in the workplace,
− The employee's desire to work (motivation), and
− Experience the employee has in performing such or similar activities.

**Expertise ($x_1$)** for the task performance is the level of qualification which the employee has for the performance of the task. The rating is mostly based on the expertise shown in practice, primarily if the employee has already performed the same or similar activities.

**Equipment in the workplace ($x_2$)** is the result obtained by the analysis of the state of the equipment used for the performance of tasks in the workplace in relation to the equipment that would enable a faster and better performance.

**Motivation ($x_3$)** is the engagement demonstrated, personal commitment in the performance of all the tasks performed so far, as well as the employee's statement and interest in performing the observed activity.

**Experience ($x_4$)** that the employee has largely depends on the number of years of service. The length of work experience that is necessary to have depends, above all, on the complexity of a given activity.

The intervals of the input and output variables of the ANFIS are shown in Table 1.

| Variable | Domain |
|---|---|
| $x_1$ | [0,1] |
| $x_2$ | [0,1] |
| $x_3$ | [0,1] |
| $x_4$ | [0,1] |
| $y$ | $[y_1,y_2]$ |

These criteria directly influence the final time required to perform certain activities or its optimization. The criteria are, by certain logical-mathematical transformations, using the algorithm of approximate reasoning, connected and give a result expressed in hours required for the performance of activities. The structure of the model for the optimization of performance time and determining the required number of employees when designing the organizational structure is shown in Figure 2.

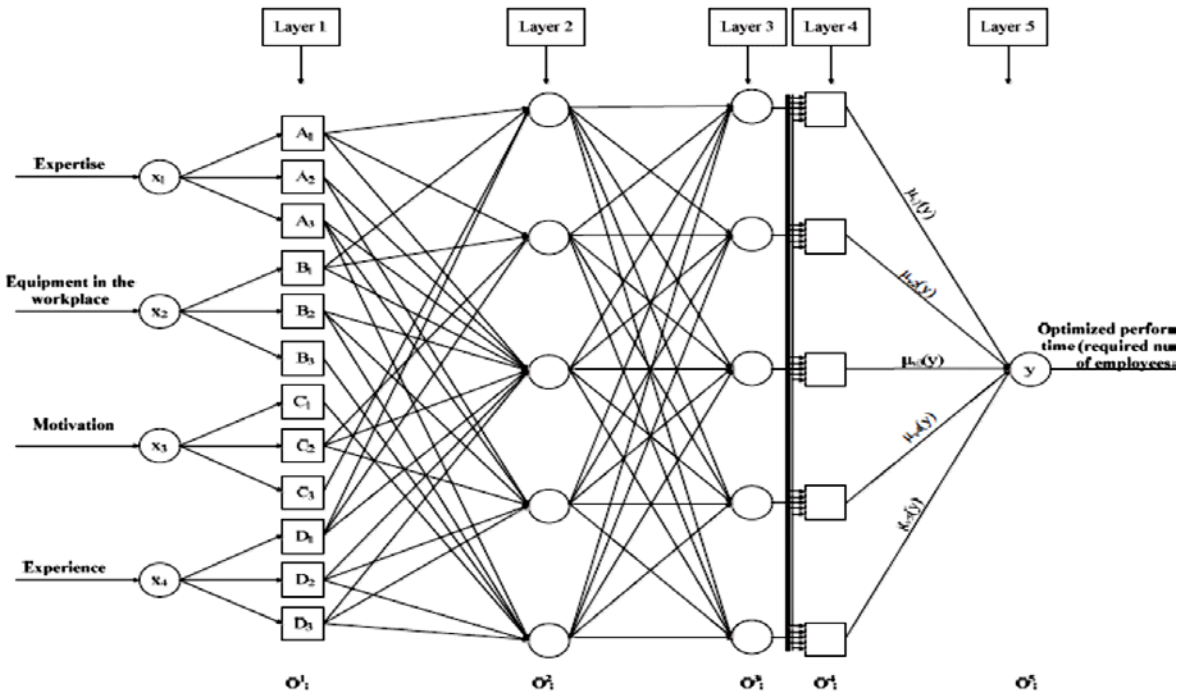


**Fig.3** A five layered feed-forward adaptive neural network for Optimization of Performance Time (OPT)

As the link between the input and the output of the fuzzy system, linguistic rules are used. The knowledge of experts on the process is expressed by a number of linguistic rules. To determine the significance of each of the criteria presented and define the rule base of the fuzzy system, a questionnaire with the information required in connection with the above criteria is sent to the addresses of 15 experts who participated in the dimensioning of organizational structures. After the replies are submitted, the data are statistically processed.

The input layer consists of 4 units: Expertise ($x_1$), Equipment in the workplace ($x_2$), Motivation ($x_3$) and Experience ($x_4$). It simply transfers inputs further via the interconnections to the hidden or first layer. All units in the input layer ($x_1$, $x_2$, $x_3$ and $x_4$) are connected with the 5 units in the first layer (Pamucar & Cirovic, 2018; Stojcic, 2018). The strengths of connections between the units in the input layer and the units in the first layer are crisp numbers equal to 1.

The first layer consists of 4+3 units representing the number of verbal descriptions quantified by fuzzy sets ("low", "medium", "high") for each input variable. Each unit in the first layer is an adaptive unit with its output being the membership value of the premise part (Cirovic, Pamucar & Bozanic, 2014).

The number of units in the second layer equals the number of fuzzy rules. Each unit in this layer is a fixed unit that calculates the minimum value of the two incoming inputs (Pamucaret al., 2016). The outputs from this layer fire strengths of rules. For example, the output from the first unit in the second layer is defined as

$$w_i = min\{\mu_L(x_1), \mu_H(x_2), \mu_M(x_3)\}$$

The third layer has five adaptive units representing the strength of the OPT ("very weak", "weak", "medium", "strong", "very strong"). Each unit in this layer calculates the intersection of a fuzzy set (consequent) with the maximum firing strength of incoming rules (Cirovic & Pamucar, 2013). For example, the fourth unit calculates the intersection of a fuzzy set "strong preference" with the maximum firing strengths of rules $R_5$, $R_6$, $R_7$:

$$\mu_{v4}(y) = \min\{w_i, \mu_{SP}(y)\} \; where \; w_i = \max\{w_5, w_6, w_7\}$$

The single unit in the fourth layer is a fixed unit that computes the overall output of the ANFIS (Stojic, Sremac, Vasiljkovic, 2018):

$$\mu_M(y) = \max\{\mu_{v1}(y), \mu_{v2}(y), \mu_{v3}(y), \mu_{v4}(y), \mu_{v5}(y)\}$$

The obtained output is then defuzzified in the single unit in the fifth layer. Selection of the final crisp value can be made in various ways (Abdul shahed and Badi, 2018). In this paper the action which is closest to the centre of gravity has been computed (Center-of-Gravity method). The output value is a real number that lies in the interval [0,1]:

$$O = Overalloutput = \sum_i w_i f_i = \frac{\sum_i w_i f_i}{\sum_i w_i}$$

### 3.2. Supervised learning

The aim of learning is to set the membership functions of the input/output variables to some adequate functions. The neural network performances are measured as the deviation between the targeted output and the model output across all numerical examples (Mukhamet zyanov & Pamucar, 2018; Stojic et al., 2018).

This discrepancy or the error measure is considered as the objective function and heuristic simulated annealing is used to minimize it. Since the application of simulated annealing (SA) requires a large number of experiments, the training process is very long. However, the tuned FIS yields results superior to those obtained by the initial fuzzy controllers and can be used in real time (Veskovic et al., 2018).

## 4. Application of the ANFIS-FMM Model in time evaluation of work activities under Green HRM

Application of the described model will be presented through evaluation of the time spent in work activities for green human resource management in the steel Industry of India. The human resource administrative bodies are organized on a functional principle and carry out their tasks through the following green human resource functions: Green HR Campaign, Recycling program, Environmental training, Implementation of Green HR Practices and Organizational Sustainability at work.

For each of the following logistic functions k tasks have been identified. In the analysis of performance evaluation of the time spent in work activities for green human resource management in the steel Industry of India, according to normative organizational structure, five positions-assignments have been planned within the Green Human Resource Managing Body (GHRMB), Fig.

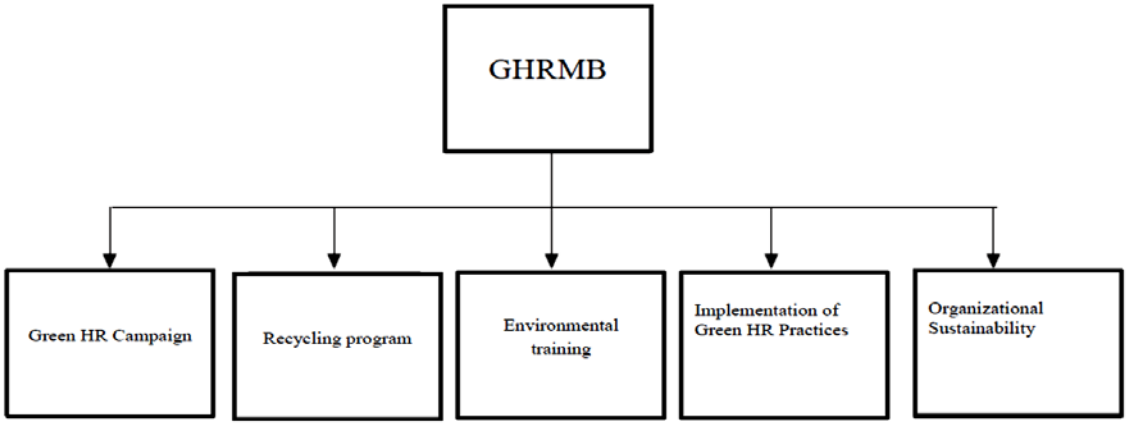


Fig.4 Existing organizational structure of the GHRMB

In designing the new organizational structure, the first step is to analyze the existing situation. It points out the need for changing and the approach in designing the organizational structure. The GHRMB is an organizational structure primarily intended for support to other units of the steel Industry of India. According to the defined goals of the GHRMB, the GHRMB directs available resources towards their implementation, by the accomplishment of a series of activities and tasks, which can be grouped into the appropriate functions of the GHRMB. Therefore, according to the tasks of the GHRMB, defined functions in the society and the Steel Industry of India, as well as the existing regulations and interviews with the GHRMB management.

The phase of division of the established functions of the GHRMB into partial assignments (tasks) is essential for determining the number of employees, because in this phase the content of features is determined. Each job consists of a number of activities that are assigned to direct employees in order to be performed. A job can have a mixed character in relation to the function affiliation. In such a case, the job affiliation is determined by the function of most of the activities that make it belong to by their character. This means that the job is obtained as a result of the analysis, or parsing each function individually. Decomposition of jobs into activities and defining the time required for their accomplishment is also important. By the methods of interview and recording, division of command jobs by employees and levels of performance has been determined, with the times needed to perform tasks.

By the analysis assessment and in cooperation with the GHRMB authorities, division of activities by employees was carried out and performance times by levels defined. The times are given in hours for a period of one year. The research found that the GHRMB has nine functions, that there are 51 jobs, 194 activities and two performance levels (the first level - GHRMB manager and the second level - GHRMB authorities). Table 2 presents194 activities (some of them are not presented because of space limitation) and their fuzzy times, as well as summarized values of optimized times by training and orientation, obtained by ANFIS-FMM optimization.

After summarizing the times by training and Orientation (from Table 2), optimization of the obtained values was done using the presented fuzzy system. In Figure 5 and 6, summarized performance times are shown by qualifications

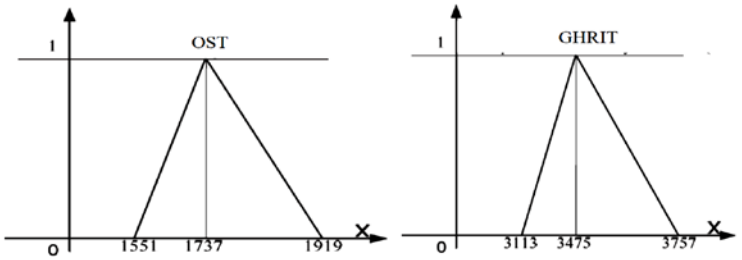


**Fig.5** Summarized performance times by training for the employees with OST and GHRIT

Table 2 Optimized fuzzy times by qualifications

| Activities | GHRT | RPO | ET | GHRIT | OST |
|---|---|---|---|---|---|
| 1 | (0,0,0) | (0,0,0) | (0,0,0) | (74,82,88) | (0,0,0) |
| 2 | (0,0,0) | (0,0,0) | (0,0,0) | (66,75,82) | (0,0,0) |
| 3 | (46,48,50) | (0,0,0) | (0,0,0) | (47,52,59) | (0,0,0) |
| 4 | (0,0,0) | (0,0,0) | (0,0,0) | (47,52,60) | (0,0,0) |
| 5 | (0,0,0) | (0,0,0) | (0,0,0) | (20,26,29) | (0,0,0) |
| 6 | (0,0,0) | (0,0,0) | (0,0,0) | (109,115,121) | (0,0,0) |
| 7 | (0,0,0) | (0,0,0) | (0,0,0) | (106,113,119) | (0,0,0) |
| 8 | (0,0,0) | (0,0,0) | (0,0,0) | (47,52,59) | (0,0,0) |
| 9 | (0,0,0) | (0,0,0) | (0,0,0) | (39,42,51) | (0,0,0) |
| 10 | (0,0,0) | (0,0,0) | (0,0,0) | (39,42,52) | (0,0,0) |
| … | … | … | … | … | … |
| 65 | (0,0,0) | (105,110,115) | (0,0,0) | (0,0,0) | (0,0,0) |
| 66 | (0,0,0) | (8,12,17) | (0,0,0) | (0,0,0) | (0,0,0) |
| 67 | (1,2,3) | (35,42,50) | (0,0,0) | (0,0,0) | (0,0,0) |
| 68 | (0,0,0) | (7,10,13) | (0,0,0) | (0,0,0) | (0,0,0) |
| 69 | (0,0,0) | (3,4,5) | (0,0,0) | (0,0,0) | (0,0,0) |
| 70 | (0,0,0) | (2,4,6) | (0,0,0) | (0,0,0) | (0,0,0) |
| 71 | (0,0,0) | (0,0,0) | (0,0,0) | (0,0,0) | (0,0,0) |
| … | … | … | … | … | … |
| 185 | (8,10,12) | (0,0,0) | (0,0,0) | (3,4,5) | (0.5,1,2) |
| 186 | (8,10,11) | (0,0,0) | (0,0,0) | (0,0,0) | (0.5,1,2) |
| 187 | (14,16,18) | (0,0,0) | (0,0,0) | (6,8,10) | (1,2,3) |
| 188 | (8,10,11) | (0,0,0) | (0,0,0) | (8,10,12) | (1,2,3) |
| 189 | (8,10,12) | (0,0,0) | (0,0,0) | (0,0,0) | (11,12,13) |
| 190 | (15,16,18) | (0,0,0) | (0,0,0) | (11,12,15) | (5,6,7) |
| 191 | (14,16,18) | (0,0,0) | (0,0,0) | (29,32,39) | (11,12,13) |
| 192 | (14,16,18) | (0,0,0) | (0,0,0) | (6,8,10) | (11,12,13) |
| 193 | (15,16,18) | (0,0,0) | (0,0,0) | (0,0,0) | (6,8,10) |
| 194 | (0,0,0) | (0,0,0) | (0,0,0) | (0,0,0) | (0,0,0) |
| Sum | (1574,1753,1953) | (1259,1365,1474) | (1636,1752,1863) | (3343,3685,4002) | (1551,1737,1919) |

**Here: Green HR Campaign training (GHRT), Recycling program Orientation (RPO), Environmental Training (ET), Green HR Implementation Training (GHRIT) and Organizational Sustainability Training (OST)**

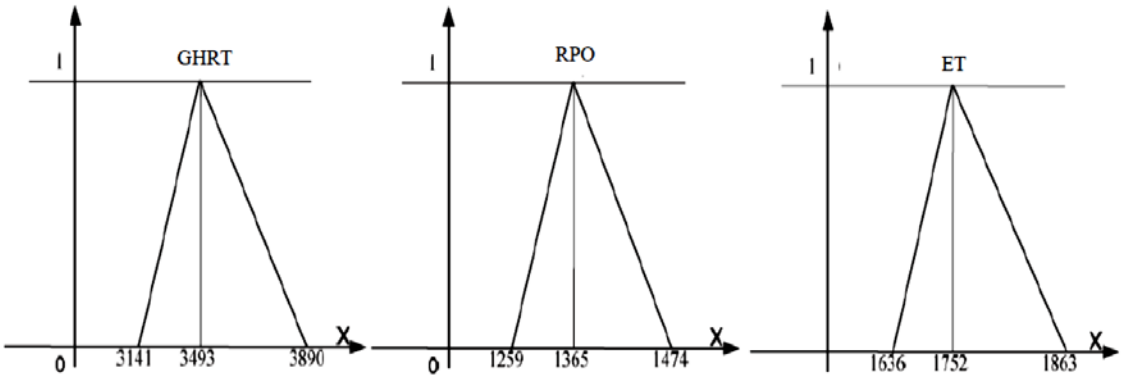


**Fig.6** Summarized performance times by Training for the employees with GHRT, RPO and ET

The total annual working hours an employee spends on performing work activities has been determined on the basis of 40 working hours for one week. The total annual working hours for a particular employee has been determined so that the total number of weeks of the year is reduced by 10 weeks that are intended for annual leave, holidays, sick leave and other absences from the workplace. So, there are the data that an employee spends around 1680 hours annually on the performance of work activities, Figure 7.

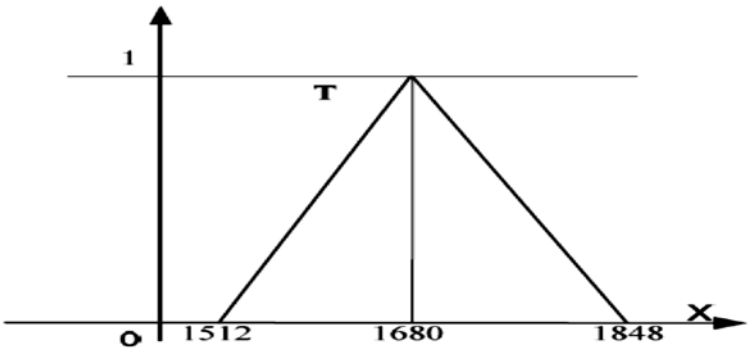


Fig.7 Total annual time one employee spends on performing work activities

The total number of employees in the GHRMB is determined as the sum of employees by levels. With changes in the assignment of functions, tasks and activities according to training, orientation and tolerable deviations for the performance times, more variants of the number of employees are obtained.

In the process of time optimization, for each training in the organizational structure, the fuzzy number is taken as confidence interval, which represents the total time the employee - executor with *n* training spends on the implementation of all the activities envisaged in hours for a year. During the practical application of the model, the interval will be proportionally adjusted depending on the obtained time necessary to be optimized. Determining the required number of employees with the given training is performed according to the expression:

$$N_{ks} = \frac{T_o^{\delta}}{T} = \frac{(T_{o1}^{\delta}, T_{o2}^{\delta}, T_{o3}^{\delta})}{(t_1, t_2, t_3)} \qquad (1)$$

Where $T = (t_1, t_2, t_3)$ triangular fuzzy number that represents the time in hours per year a person spends in the workplace and which is determined by assessment and $N_{ks} = (N_{ks1}^{\alpha}, N_{ks2}^{\alpha}, N_{ks3}^{\alpha})$ fuzzy number that represents the required number of people with *s* training for the execution of all the activities envisaged for this training.

In order to calculate the required number of employees by qualifications, the summarized fuzzy times by qualifications should be divided with the total annual working time (Figure 6). This relation is expressed by the equation 1. The required number of employees with Organizational Sustainability Training (OST) is defined based on the equation 1.

$$N_{OST} = \frac{(1551,1737,1919)}{(1512,1680,1848)} = \left(\frac{1551}{1848}, \frac{1737}{1680}, \frac{1919}{1512}\right) = (0.84,1.03,1.27) \quad (2)$$

Defuzzification of values which represent the total number of operators (N ) by using the following equation:

$$g_{\alpha,\beta}(N) = [\beta * f_{\alpha}(N_{k1}) + (1-\beta) * f_{\alpha}(N_{k3})], \ 0 \le \beta \le 1, 0 \le \alpha \le 1 \quad (3)$$

Where $f_{\alpha}(N_{k3}) = N_{k3} - (N_{k3} - N_{k2}) * \alpha$ is the right limit value of the fuzzy number confidence interval N; $f_{\alpha}(N_{k1}) = (N_{k2} - N_{k1}) * \alpha + N_{k1}$represents the left limit value (threshold) of the fuzzy number confidence interval N. The value $\alpha, \ 0 \le \alpha \le 1$ represents the preference of the decision-maker, while the value, $\beta, 0 \le \beta \le 1$ represents the pessimistic index of the decision-maker. Different values of the degree of certainty,as well as changes in the allocation of functions, tasks and activities in accordance with the qualifications of the operators, give a larger number of the organizational structure alternatives. The final number of required employees with GSE qualification is determined by equation (3), Table 4.

**Table 4:** Required number of employees

| GHRT | RPO | ET | GHRIT | OST | TOTAL |
|---|---|---|---|---|---|
| 2 | 1 | 1 | 2 | 1 | 7 |

Table 4 shows the required number of employees, and their distribution by levels, according to Training Programs and specialties is shown in Tables 5 and 6, respectively.

**Table 5**: Number of employees by levels according to Training Programs

| Level | Training Programs | Number of Employees |
|---|---|---|
| GHRMB Manager | Environmental Training | 1 |
| GHRMB Authorities | Environmental Training | 3 |
| | Organizational Sustainability Training | 3 |

**Table 6**: Number of Employees by levels according to specialties

| Level | Specialty | Number of Employees |
|---|---|---|
| GHRMB Manager | Green HR Implementation Training | 1 |
| | Green HR Implementation Training | 3 |
| GHRMB Authorities | Recycling program Orientation | 1 |
| | | 2 |

The proposed mathematical models allow for the application of fuzzy multi-criteria methodology, the method of multi-criteria decision-making for the selection of appropriate organizational structure and dimensioning of organizational structure using a fuzzy model for determining the required number of employees and optimization of the time spent on performing certain functions, tasks and activities.

## 5. Conclusion

The green Human assets management has emerged from organizations engaging in practices associated with protection of surroundings and preserving ecological balance. Green HRM encompasses all activities geared toward supporting an agency perform its schedule for surroundings control to reduce its carbon footprint in regions worries on boarding and acquisition of human resources, their induction, performance appraisal & control, training and development and pay and reward management. In experienced HRM can play a beneficial position in enterprise in selling environment related issues by way of adopting and following in experienced HR guidelines and move. Green HRM can beautify company image and logo. In experienced HR will play an important role in making the employees aware of and worried for protection of natural assets and make contributions in pollutants manipulate, waste control and manufacture of green merchandise.

The proposed technique model will assist the working towards managers and future researchers comply with green HRM strategies. the prevailing study also proposes destiny researchers to fill the space inside the existing literatures by way of accomplishing empirical studies consisting of inexperienced HRM practices within the production or service agencies (mainly the agencies that are polluting surroundings, evaluating green HRM practices among evolved and growing nations, inexperienced perceptions, attitudes of agency and personnel, boundaries within the inexperienced HRM implementation etc. the present look at has made an strive to investigate the notion of employees about the green HRM tasks carried out via the respective businesses. it's been determined that, agencies have been imposing some of inexperienced HRM tasks. But, more severe method desires to be taken to implement them, communicate them to the employees, encourage

employees to stick to such initiatives, and praise them, accurately. Additionally, it's miles vital to include the inexperienced HRM coverage into diverse HRM capabilities, such as, recruitment, induction, education, and so forth. The study also indicates that, employee involvement and participation could play a pivotal role in promoting in experienced HRM enhancing organizational environmental performance by using focusing on waste control, recycling, maintaining fitness and protection standards, enforcing getting to know from education modules, and selling surroundings friendly organizational culture. Doing so, companies would not directly add fee to their corporate branding, there by paving the manner for a purifier, more secure, and extra green working surroundings for the personnel and the employer stakeholders. It's far essential to remember the fact that, extra studies need to be carried out to become aware of the world precise environment-control problems. Additionally, there may be a scope for similarly studies to analyze the impact of inexperienced HRM on organizational overall performance. However, the existing take a look at has been capable of become aware of a number of troubles in regard to implementation of green HRM, at workplace in the production industries located in Coimbatore.

In setting the problem, the main considerations are in dimensioning of organizational structures with the resource allocation in hierarchically structured business systems with special emphasis on the fuzziness and uncertainty of the times required for the execution of certain functions, tasks and activities. The fuzzy logic system based on the algorithm of approximate reasoning allows the time optimization and correlates the time needed for the execution of certain functions, duties and activities with the expertise, motivation, equipment in the workplace, necessary means and experience.

This ANFIS-FMM model extends the framework of theoretical knowledge in the field of Green HRA. The model presented allows for the reduction of subjective impact in designing organizational solutions, improving the methodology of designing organizational structures, as dynamic changes in the society require the systems to constantly change and adapt, then, accelerating and facilitating work of the bodies engaged in organizational solutions of the systems and achieving better efficiency in functioning of the observed systems through the selection of adequate employees with appropriate skills and means. The proposed methodology was checked by model testing, as well as by validation of the model, on the example of defining the organizational structure of the GHRMB in the Steel Industry of India.

The model has four main advantages over other conventional HRA methods. First, the system possesses adaptability, which is reflected through setting the base of neuro-fuzzy rules based on the characteristics of earlier human resource portfolios and the managers' heuristic experiences. The set of fuzzy rules is essential for strategic management, especially in cases when a descriptive

approach is used, one that prefers intuitive, heuristic problem solving. Second, this HRA model is efficient in conditions of uncertainty. Therefore it could provide support to decision makers in the process of making the HRA strategies in uncertain environment. Third, the neuro-fuzzy based HRA model allows for dynamic decision making in HRA management through the implementation of a computer-based system. The suggested HRA model enables fast and objective assessment of the human resource portfolio in a changeable environment. Fourth, this model can be IT-supported with the formation of the appropriate database, and thus be an elegant design of the organizational structure, through the completion of changes in the assignment of functions, tasks and activities according to the qualifications of employees. The fuzzy linear and dynamic programming in collaboration with heuristic and meta heuristic methods are suitable and applicable approaches in practice. It is recommended to consider the portfolio of human resource strategies using the genetic algorithms, with defining the limitations that can be analyzed by fuzzy linear programming.

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