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Designing and Fuzzification a Comprehensive Expert System of Higher Education Institutions Performance Evaluation Based on Balanced Score Card & Fuzzy Multi-Criteria Decision Making

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Abstract. Higher education plays a very vital role in developing human resources as well as economic ones in every country. In so doing, the act of evaluation would help the decision makers as well as managers to spot the weaknesses to use the required provisions to work more effectively. The present study with a different approach toward the designing a comprehensive evaluation expert system using Fuzzy Logic technique regarding evaluating the performance of Higher Education Institutes conducted as a case study on Azad University of Najaf Abad. Appropriate criteria for evaluation were selected through balanced score card as a

comprehensive methodology of evaluation. Then, based on four perspectives of Balanced Score Card, criteria were categorized on priority and the level of importance employing Fuzzy multi-Criteria decision making. Then, drawn upon the results of the previous step, a performance evaluation fuzzy expert system based on the criteria's weights was designed using the tool box of Fuzzy Logic in MATLAB software.

Keywords: Balanced Scorecard, Fuzzy Analytical Hierarchy Process, Performance Evaluation, Higher Education Institute, Expert System, Fuzzy Logic.

1. Introduction

The international milieu with such features as rapid change, the quick rate of information, and the growing competition resulted from the unification of the boundaries, all made the Higher Education be steered more than ever by the drives of competitive markets along with business and economic requirements which is no more marked by state identification (Mehregan, Dehghan nayeri, 2009). Many Institutions supply a high percent of their facilities from external resources, economic and commercial enterprises. These limited resources and the desire to motivate the students all caused a competitive market for such institutions.

Thus, the desire to sustain in this competitive situation would lead them to attend more to the managing and strategic programming to enhance adaptation to changing environment as well as the ability to satisfy the customers (Pineno, 2008). Regarding the developing rate of universities in a few recent decades as well as the competitive ways of student recruitment, it seems that economic purposes in comparison with the other ones excelled in making more interest through social services. It is inevitable hence for every universities to replace traditional management with modern business to reach the goal of survival and sustainability. Competitive threat and environmental pressures imposed on organizations to get better and more efficient to face the challenges ahead made them look at evaluating the performances as an important necessity. Pushing the organization toward the future where the main

element of success are technology and organizational potentials and competition is exacerbating more than ever is not merely possible through controlling the past financial criteria. So a comprehensive methodology for evaluating the performance of the University, according to its strategy is of utmost importance. Balanced Scorecard considering both tangible and intangible assets and their effects on each other is recognized as a comprehensive method for evaluation performance. The measuring criteria of balanced method are extracted from within the strategies and perspective of the organization. However, Higher Education Institutes should use this to improve their performance to avoid the traditional kinds of evaluation with specific orientation. The necessity of employing this method of evaluation is clear especially in those institutions where the intangible assets are more than the tangible ones such as Educational Institutions wherein financial issues are of least importance and the effectiveness of educational resources (whether students, professors or the textbooks) on these organizations are high (Umashankar, Dutta, 2007). Based on what went before about different use of Balanced Scorecard model in various forms of academic system, the significance of this study is the designation of a fuzzy expert system of performance evaluation that lacks in literature. The main objective of this study is the presentation of a fuzzy expert system of performance evaluation assisting Balanced Scorecard and its synthesis with Fuzzy Analytical Hierarchy Process. First, the literature is overviewed. Then, the subject and how of selecting the key evaluative indices of performance out of the strategic programming of the organization is explicated based on four perspectives of Balanced Scorecard. Afterwards drawn upon the ideas of the experts, appropriate criteria and indices of evaluation are selected and their positions in respect of each other is measured using Fuzzy Analytical Hierarchy Process. Based on the weight of measured indices in the given case study, a performance evaluation fuzzy expert system using Fuzzy Logic notion is designed.

2. Overview

2.1. Balanced Score Card

It is a performance evaluation method for organization. This was first introduced by Kaplan & Norton in 1991. The nature of Balanced

Scorecard is that it will render the viewpoint, mission, and strategy of the organization to appropriate shapes and purposes which are categorized into four perspectives of financial, customer, internal processes, growth and learning (Kaplan, Norton, 1996a). Performance measures are tools used to ensure the successful achievement of goals which move towards the successful implementation of the strategy (Goran, Sjostrand, 2005). The features of key indices include: they are non-financial, measured repeatedly and have significant impact on the key elements of success, finally a positive effect on all performance indices (Parmenter, 2010). In other words, the key indices of performance are the performance measuring indices which are used in organizations and institutions to assist the task of evaluating quantitative improvement along with achievement stories (Mei Yean et al., 2012; Xiong et al., 2010). In Balanced Scorecard, the organization is considered from four perspectives. In figure 1, these four perspectives and their interactions are briefly shown. These four perspectives which is first introduced by Norton and then is developed by Kaplan includes financial, customer, internal processes, growth and learning.

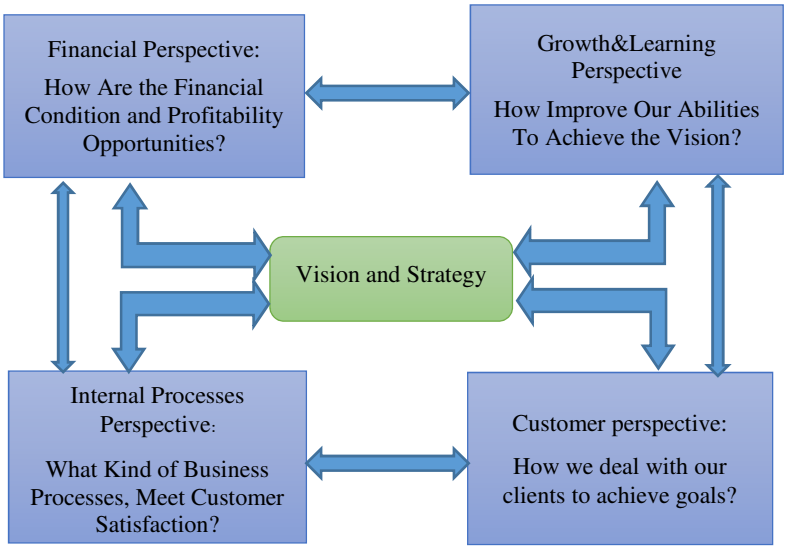

Figure 1. The four perspectives of BSC

Those organizations which employ the Balanced Scorecard should coordinate it with their own situations (in terms of the kind of industry they are involving in as well as the profit or non-profit kind of the organization), and their own internal processes. Thus, it is not necessary for the organization to consider all the perspectives of Balanced Scorecard. On the contrary, the organization can add another perspective based on their needs to fulfill the objectives of the organization.

2.2. Analytical Hierarchy Process (AHP)

It is one of the most popular techniques of multi-criteria decision making that is invented by Thomas L. Saati in 1970s. This method is mainly used for comparing many options and indices. To form it, first the hierarchy tree of decision which shows the choice and index of decision making is drawn and then a couple of paired comparisons is made. These comparisons will clearly demonstrate the weight of each factors against the opposite ones. Finally AHP logic will synthesize the given matrices to get the optimum result.

In AHP, two criteria are compared to each other; their degree of closeness is defined with a numerical value (Sarfaraz, Mukerjee, Jenabb, 2012). Regarding the fact that presenting the judges verbally for the decision makers is easier than providing an answer for sure, so it is of importance to use Fuzzy notions in decision makings. In 1996, the method of "Developmental Analysis Method" was first introduces by a Chinese researcher called Chang. The used numbers of this method were Fuzzy Triangular numbers (Momeni, 2006).

3. Related Literature

The necessity of evaluating the performance of the Higher Education Institutions, is so important and also unacceptable performance of them as the result of deficiency or ineffectiveness of the strategic program that bears no retrievable effect .With on-time act of spotting and changing the strategies of the organization, one can step into the right path. In these institutions due to emphasis on educational indices, the evaluation would take place on the educational variables. The literature is filled

with the following cases employing Balanced Scorecard Method: The study by Mehregan & Dehghan (2009) is conducted to demonstrate the strong and weak points of Balanced Scorecard considering the environmental situations of Higher Education Institutes and its local model in university levels of Iran is also presented (Mehrgan & Dehghan Nayeri, 2009). Amaratonga and Baldri employed the Balanced Scorecard to measure the performance of the Graduates to show the relation of performance measurement and the quality of performance (Nayeri et al, 2008).

Einstein and Papenhausen used Balanced Scorecard in Management Faculty of Massachusetts University (Chris P., Einstin W., 2006). Cullen et al. studied the Balanced Scorecard Model in Management Faculty and Administrative Science center of UK in which 21 criteria for strategic evaluation is identified (Cullen et al., 2003). Delker explored the ways to extend the Balanced Scorecard Method and defined the performance indices to measure the strategic position of the University of California (Delker, 2003). BSC model is also used to evaluate the educational programs of the graduates and Educational Institutes in India (Umashankar, Dutta, 2007). On what went before about the different use of balanced Scorecard model in various forms of universities, BSC model is used in this study to evaluate performance.

4. Methodology & Data Analysis

In this part, the goal is the identification & selection of the efficient criteria involving in the development of Higher Education Institutes along with their level of importance. In their selection, the attempt has been made to coordinate the criteria and indices with the evaluation purposes. To choose the criteria, three options were considered important that are:

1. Reviewing the related literature; **2.** Studying the strategic program of the university, **3.** Consulting with the experts. To get the preferences of each criteria over the other ones, Fuzzy Analytical Hierarchy Process was employed. The procedure of this study is as below:

First, the performance evaluation indices are identified based on four perspectives of Balanced Scorecard. Then the experts' ideas on matrix

prioritization criteria were sought based on Fuzzy data. Doing paired comparisons using Expert Choice Software, the indices were prioritized. The Final inconsistency Rate of pairing comparison matrix in this study is about 0.03 that is acceptable. Figure 2 demonstrates the procedures of this study.

In calculating Analytical Hierarchy Process technique, the method of "Developmental Analysis Method" of Chang is used.

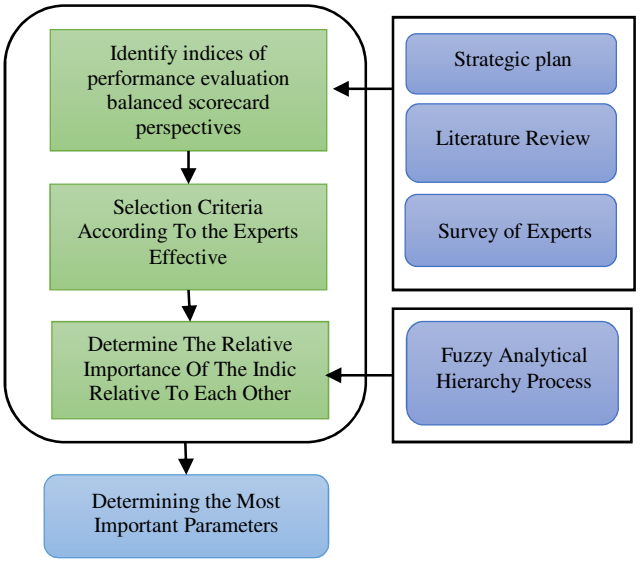

Figure 2. Procedure of study

Stage 1: Setting the Hierarchy Structure

Identifying the performance evaluation indices and choosing the best one:

The goal of each piece of decision is to set the degree of priority of each given index in evaluating the performance of the university. Regarding the selection of the given indices for performance evaluation after considering the strategic programs, it is clear that the available indices is widespread in this program and there is the possibility of neglecting the prominent indices.

To avoid this, the attempt has been made to survey the experts and review the related literature in order to select the most important indices

that determine the growth rate of the university, the focus on which can sharpen the act of evaluation.

Hence, the effective parameters on performance evaluation is classified into four perspectives of BSC, 12 criteria, and 28 indices. This classification is based upon the literature and also the opinions of experts.

The classification based on four perspectives of BSC is explicated in the following charts:

Table 1. Criteria, Sub criteria & indicators in financial perspective

Growth and Learning Perspective	**Empowering employees**	training programs for employees
		Proportion between expert with Their duties
	Masters	Papers
		Increase the number of books
		Academic rank of professors
	Strategic Planning	Strategies in the field of Education and Research
		Strategies to attract and strengthen Masters
	IT Status	Design and implementation of virtual education
		The number of online specialized databases

Table 2. Criteria, Sub criteria & indicators in Customer perspective

Financial perspective	**Increase Revenue**	The Amount Of Tuition Revenue
		The amount of scholarship
		Amount of university-industry collaboration
	usage Rate of Assets	Sharing of facilities
		Usage Rates of facilities and library resources
	Budget	Research Budget
		Educational budget
	Facility	facilities
		Internet Access

Table 3. Criteria, Sub criteria & indicators in Internal processes perspective

Customer	**Increase student satisfaction**	students Satisfaction of education
		Increasing acceptance in MA and Doctoral
		Quality of education

		assessment of the Ministry of Higher Education
	Reputation	University's reputation
		Training courses With evidence

Table 4. Criteria, Sub criteria & indicators in Growth and Learning perspective

perspective	**Standardization**	Clarity of Duties
		Speed of decision making
	Technology	use of e-learning technology
		Setup and automation systems
		Updating the IT systems

Stage 2: Measuring the weights of indices in respect to each other:

Setting Fuzzy pairing comparisons matrices (FCM): after selecting the criteria based on four perspectives of BSC, the matrices of pairing comparison of indices in proportion to the criteria and on the other hand the criteria in proportion to each other, using Fuzzy number of figure 5 is done by 18 experts (managers, experts of various deputies in university).

In this stage, the whole comparisons of each category hired Fuzzy triangular number. In this method, the experts explicated their pairing comparisons on the prioritizations of the criteria with a fuzzy value that is equal to a verbal phrase.

Table 5 shows the membership function of verbal phrases used for giving weight:

Table 5. Transforming Linguistic variables into fuzzy numbers

Verbal Phrase	**No.**	**Triangular fuzzy number**	**Reverse fuzzy number**
Equal	1	(1,1,1)	(1,1,1)
Interstitial	2	(1,2,3)	$(\frac{1}{3},\frac{1}{2},1)$
A Little Important	3	(2,3,4)	$(\frac{1}{4},\frac{1}{3},\frac{1}{2})$
Interstitial	4	(3,4,5)	$(\frac{1}{5},\frac{1}{4},\frac{1}{3})$
More Important	5	(4,5,6)	$(\frac{1}{6},\frac{1}{5},\frac{1}{4})$

Interstitial	6	(5,6,7)	$(\frac{1}{7},\frac{1}{6},\frac{1}{5})$
Much More Important	7	(6,7,8)	$(\frac{1}{8},\frac{1}{7},\frac{1}{6})$
Interstitial	8	(7,8,9)	$(\frac{1}{9},\frac{1}{8},\frac{1}{7})$
Absolutely Importantly	9	(8,9,10)	$(\frac{1}{10},\frac{1}{9},\frac{1}{8})$

Stage 3: Calculating the importance of index weight and determining the final weight:

The calculations made to determine the degree of prioritization of indices and final weight based on "Developmental Analysis Method" of Chang is described below:

For each line of pairing comparison matrix, the value of S_k that is a fuzzy triangular value is calculated as follow (Asgharpour, 2008):

$$S_k = \sum_{j=1}^{n} M_{kj} \times \left[\sum_{i=1}^{m}\sum_{j=1}^{n} M_{ij}\right]^{-1} \qquad (1)$$

K represents the line number; i & j are respectively indicative of the options and indices. In this method, after measuring all the S_k, their degree of largeness in proportion to each other must be calculated. In general, if M_1 & M_2 are two Fuzzy Triangular values, then the largeness degree of M_2 on M_1 that is shown by v ($M_1 \geq M_2$) is defined as:

$$\begin{cases} V\left(M_1 \geq M_2\right) = 1 & \text{if } m_2 \geq m_1 \\ V\left(M_1 \geq M_2\right) = \text{hgt}\left(M_1 \cap M_2\right) & \text{Otherwise} \end{cases} \qquad (2)$$

We have also:

$$\text{hgt}\left(M_1 \cap M_{2q}\right) = \frac{u_1 - l_2}{\left(u_1 - l_2\right) - \left(m_2 - m_1\right)} \qquad (3)$$

The degree of largeness of one Fuzzy Triangular value (M) from another Fuzzy Triangular value of k (M_i; i=1, 2, , k) is calculated by:

$$\begin{aligned} &V(M \geq M_1, M_2, \ldots, M_k) \\ &= v[(M \geq M_1), \ldots, (M \geq M_k)] \\ &= \min\ v(M \geq M_i)\ i = 1,2,\ldots,k \end{aligned} \qquad (4)$$

To calculate the weight of the indices in pairing comparison matrix, the following equation is used:

$$W\left(x_i\right)=\min\left\{v\left(S_i \geq S_k\right)\right\}, \quad k=1,2,\ldots,n., \ k \neq i \tag{5}$$

Table 6. Final ranking of the indices

Goal	Perspectives	Criteria	Parameters
Evaluation performance of University	**Financial Perspective (0.145)**	Increase Revenue (0.358)	The Amount Of Tuition Revenue (0.023)
			The Amount Of Scholarship (0.008)
			Amount Of University-Industry Collaboration (0.021)
		usage Rate of Assets (0.263)	Sharing of facilities (0.608)
			Usage Rates of facilities and library resources (0.393)
		Budget (0.199)	Research Budget (0.609)
			Educational Budget (0.391)
		Facilities (0.180)	facilities (0.603)
			Internet Access (0.397)
	Customer Perspective 0.487))	Increase student satisfaction (0.455)	students Satisfaction of education (0.625)
			Increasing acceptance in MA and PHD (0.162)
			Quality of education (0.115)
			assessment of the Ministry of Higher Education (0.198)
		Reputation (0.5456)	University's reputation (0.913)
			Training courses With evidence (0.087)
	Internal processes & perspective (0.083)	Standardization (0.522)	Clarity of Duties (0.249)
			Speed of decision making (0.0751)
		Technology (0.478)	use of e-learning technology (0.266)
			Setup and automation systems (0.495)
			Updating the IT systems (0.239)
	Growth and Learning Perspective (0.285)	Empowering employees (0.158)	training programs for employees (0.502)
			Proportion between Duty and expertise (0.498)
		Masters (0.535)	Papers (0.558)
			Academic rank of professors (0.442)
		Strategic	Strategies in the field of Education and

		Planning (0.166)	Research (0.505)
			Strategies to attract and strengthen Masters (0.495)
		IT Status (0.142)	Design and implementation of virtual education (0.505)
			The number of online specialized databases (0.495)

Hence, the weight vector indices of W'(xi) is as followed that is the same as vector coefficients of the non-normalized fuzzy analytical hierarchy process (Momeni, 2006):

$$W'\left(x_i\right)=\left[w'\left(c_1\right),w'\left(c_2\right),\ldots,w'\left(c_n\right)\right] \qquad (6)$$

Using the following equation, the non-normalized results from the above equation would turn normal. The normalized result achieved from the following equation is called "Normal Weight":

$$w_1=\frac{w'_1}{\sum w'_i} \qquad (7)$$

For each of these pairing matrices presented by the decision makers, the final weights are calculated by geometric mean:

$$a_m=\prod_{k=1}^{r} w_k \qquad (8)$$

And finally by using Analytical Hierarchy Process and the coefficient matrices of weight indices comparing with the criteria, the final ranking of the indices are calculated:

In this study, out of 28 selected indices, the weight of each is determined by Fuzzy AHP, the priority of which is defined upon the given results. Regarding the outcome, a system of performance evaluation is designed. To modeling the system, Fuzzy Logic is used.

5. Designing a Fuzzy System

The complicated systems include different kinds of fuzzy states and it causes numerous challenges in modeling. Fuzzy Logic Models uses the fuzzy complexes to manage and describe ambiguous phenomenon along with logical operations. Fuzzy sets particularly fuzzy numbers and fuzzy

logic are applied to control issues that forms an area of knowledge called Fuzzy Logic Control (FLC).

It deals with control issues in uncertain and imprecise environment when precision is not required and the controlling object includes the variables available for estimation. Imitating human judges in FLC, uses common reasoning from values in terms of **IF… THEN** rules. Implementing FLC requires developing knowledge base to clarify if…then rules to make it possible through Fuzzy Complexes (Gholipour, 2013).In designing this expert system, the tool box of Fuzzy logic of Matlab software is used. In this system, the function of triangular membership is employed for input and output functions that is more common. Of course, the form and type of the functions is defined according to the experience, the kind of problem and its structure. Hence, different functions of triangular, trapezoidal, Gaussian shapes or the defined functions adopted by the user can be selected. The mathematical definitions related to the membership degree in triangular membership functions is also indicated in the present study.

The mathematical definition of triangular fuzzy number of A type:

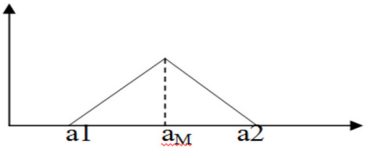

Figure 3. Display triangular fuzzy number, Type A

Figure 4 shows the designation of membership function of one of system inputs on scale of 1 to 10:

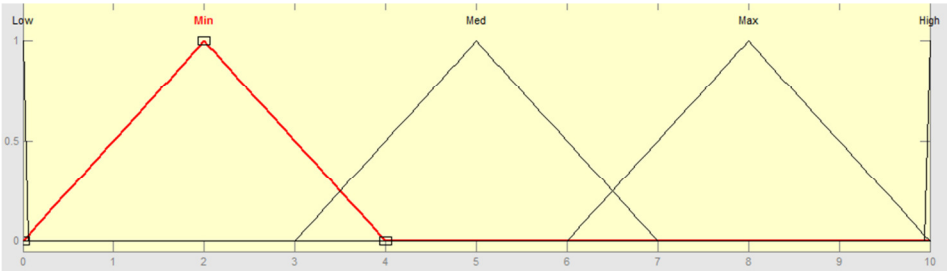

Figure 4. Designing Membership functions for one of the inputs

Figure 5 shows the designation of membership function of one of system outputs on scale of 1 to 10.

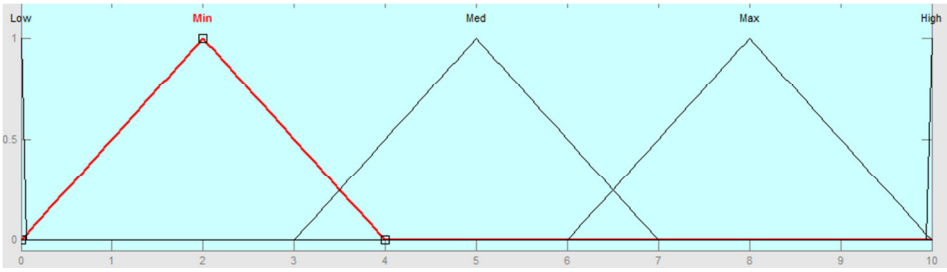

Figure 5. Designing Membership functions for one of the outputs

6. Fuzzy Inference Rules in Expert System of Performance Evaluation

Inference rules in this expert system that is equal for the given four perspectives in Balanced Scorecard is as follows:

1. If the size of all the indices is low in the given perspective, then the output of that perspective in expert system of evaluation, or in fact the evaluation outcome of that perspective is low.
2. If the size of all the indices in the given perspective is medium, then the output of that perspective in expert system of evaluation, or in fact the evaluation outcome of that perspective is medium.
3. If the size of all the indices is high in the given perspective, then the output of that perspective in expert system of evaluation, or in fact the evaluation outcome of that perspective is high.
4. If the size of all the indices is low, medium, or high in the given perspective, then the output of that perspective in expert system of evaluation, or in fact the evaluation outcome of that perspective is dependent on fuzzy rules used in the expert system evaluation as well as the weight of the rules.

This method of inference in the form of Fuzzy rules in Matlab as an example for No.21 (the level of educational program and the courses hold for the personnel), is described as: (the within-parentheses numbers after each rule are the weight of the rules. Here the weight is the outcomes resulted from indices evaluation by the experts).

1. **If (M21 is Min) then (growth_and_learning_perspective is Min) (0.028)**
2. **If (M21 is Med) then (growth_and_learning_perspective is Med) (0.028)**
3. **If (M21 is Max) then (growth_and_learning_perspective is Max) (0.028)**

You can also consider the machine language version of these rules based on which the system would draw inferences:

1. **1. (M21==Min) => (growth_and_learning_perspective=Min) (0.028)**
2. **2. (M21==Med) => (growth_and_learning_perspective=Med) (0.028)**
3. **3. (M21==Max) => (growth_and_learning_perspective=Max) (0.028)**

6.1. The Sample System Test Designed to Evaluate Performance with Hypothetical Inputs:

In this part, the attempt is made first to describe the outcomes of a hypothetical different test to evaluate performance, for instance in the perspective of 'learning & growth' and then their rates are to be compared to each other. Afterwards, the accuracy of system is measured in normal and particular conditions with manual calculations.

The evaluations carried out by the expert A regarding 8 indices of this perspective are as follows: [**5 3 4 7 3 6 2 4**]

After entering these scores in the designed system, the evaluations conducted by the expert **A** equals to 5.39; the middle is the norm according to the figures. Here is the membership function figure and the how of inferences:

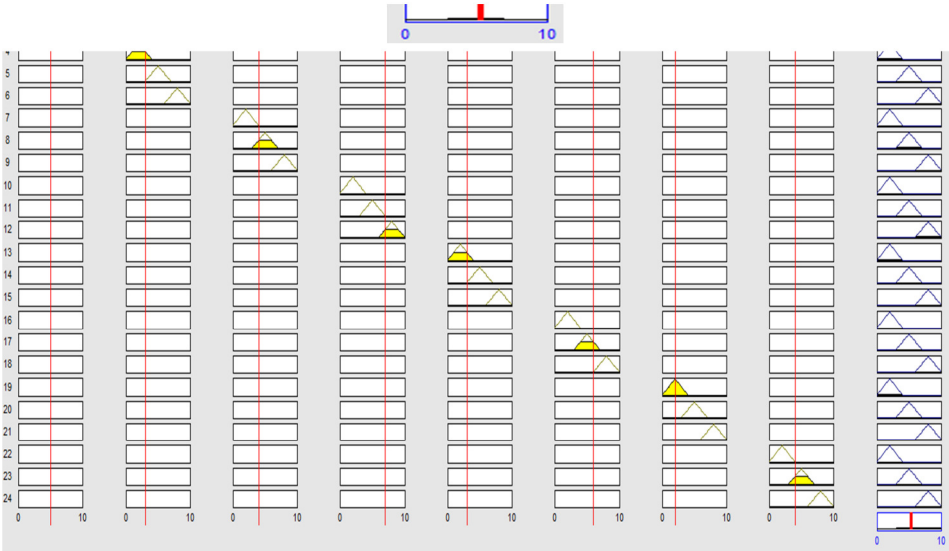

Figure 6. Membership expert system evaluated by expert A

6.2. The Validation of Fuzzy Comprehensive Expert System Rules of Performance Evaluation

Evaluating particular states: the first important point in system testing is evaluating two particular states wherein all the indices are either equal to 0 or 10. In the first case according to figure 7, the system found 0 as the final answer that is acceptable. In cases all the indices are equal to 10 according to figure 8, the final answer is equal to the final possible rate of output i.e., 10, and it confirms the accuracy of performance in system.

Figure 7. Final Answer (all the indices are either equal to 0)

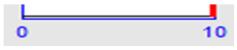

Figure 8. Final Answer (all the indices are either equal to 10)

In order to continue the testing accuracy process and confirming the rules of inference motor of expert system, the evaluation made by expert A is calculated manually according to available formulas; the final answer is compared with the final outcomes of expert system. Little

difference in the results of the either way is indicative of the accuracy of the designation of the assumed rules and expert system. Meanwhile, in designing, the operators of "maximum aggregation method", "Maximum OR method", "Minimum implication method", it is used from Minimum and Centroid defuzzification, that is the same in manual calculations. To ensure more, we calculate manually the total evaluated score that is done by expert (A), using fuzzy mathematics method. The numbers are chosen in a way that different states are considered in membership function. To do manual calculations, for a membership function of fuzzy triangular, the following mathematical formula of membership degree is offered:

$$\mathbf{A} \triangleq \mu_{\mathbf{A}}(x) = \begin{cases} \frac{x-a_1}{a_M-a_1} & \text{for } a_1 \le x \le a_M, \\ \frac{x-a_2}{a_M-a_2} & \text{for } a_M \le x \le a_2, \\ 0 & \text{otherwise,} \end{cases} \qquad (9)$$

For defuzzification, the following formula is operated according to Centroid Method:

$$\left[FD = \frac{\sum \mu \cdot D}{\sum \mu} = \frac{\mu l.D_l + \mu m.D_m + \cdots}{\mu_l + \mu_m + \cdots} \right] \qquad (10)$$

Noteworthy to add that in displaying the value of μ (X) on the diagram, in terms of clarity, the related weights of rules has not been regarded into consideration. However, the effect of the weights is considered in calculations.

6.3 Evaluating the Indices of 'Learning & Growth' Perspective by the Expert A:

After mapping and measuring the size of membership of the variables on output functions based on maximum aggregation method, we choose on each output membership function, the mapped surfaces with maximum value: [**5 3 4 7 3 6 2 4**]

Obtaining the final aggregate diagram of output, then we respond to defuzzification with centroid method. It is noteworthy to add that the more the number of selected points, the more accurate response we have. As you consider, the given response is close to the measured one

by the written rules in inference motor of expert system (5.39). It surely confirms the accuracy of the rules.

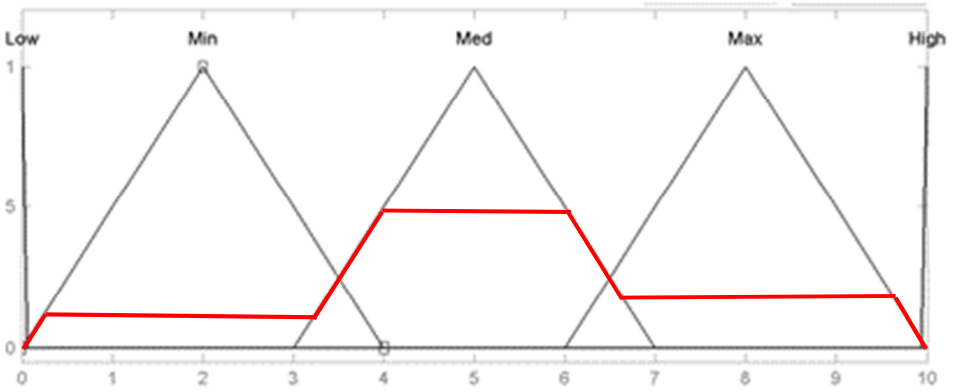

Figure 9. Output Diagram, The maximum aggregation

7. Conclusion

The present study not only practiced one of the most prominent model of performance evaluation called Balanced Scorecard but also presented the themes and components of performance evaluation in Educational universities and institutions to use them to design a fuzzy expert system of performance evaluation. The result of this study can be put into two frameworks that are theoretical and applied. Designing fuzzy expert system upon the data obtained from the previous stage (balanced evaluation using Fuzzy Analytical Hierarchy Process) is indicated as the applied result of the study. It is recommended to use it as a modern solution for the comprehensive evaluation of performance to organizations because affecting experts' ideas in the form of Fuzzy variables in scoring, one can adapt the indices to the changing environmental situations and the value and precision of the results made from evaluation to use it in succeeding decision making is increased. Regarding the theoretical results as the last station of this study, one can refers to the given outputs of evaluation (from Balanced Scorecard). Drawn upon that, the study clarified the most prominent indices determining the rate of development and elevating the status of university. It also assists the principals to improve their performance with a closer focus on it. Though previous records would assist us more

in selection of these indices as well as evaluation criteria, it is necessary to define and localize these methods in a given organization. Of course if ever the quality of strategic plan of the organization is no more acceptable, the mere use of these indices and evaluation methods will not lead to improved performance. On the other hand, there exists some other qualitative elements, the precise evaluation of which is ambiguous and quantification of these qualitative indices requires further research. What is significant after the act of evaluation is the support of top-level managers particularly the seniors from implementing the results of evaluation. Otherwise the resistance to any changing or probably apathy or the lack of desire for hardworking would lead to a gap between the results of implementation in practice and in potentiality.

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