MANAGERIAL CLASSIFICATIONS USING THE FUZZY FUNCTIONS

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ABSTRACT

With "Managerial classifications using the fuzzy functions" we have tryed to offer a different way to determine a hyerarchi between objectives , objectives that are different then the ones analyzed so far with the FUZZY functions. Comparing to the applications that were created so far with the help of FUZZY functions, this model is based on the fact that the person using the application is aware of the possible characteristics that are attached to the objectives, and thus can permit the comparison in equal conditions.

Furthermore , the result analysis must be done by people that know the field in question in order to be able to select the correct results, based on real and comparative data, from the insignificant data.

New fields that can benefit from the FUZZY functions are: companies, subcompanies, sports, the press, and any other field that can establish real comparative characteristics.

KEY WORDS: *hierarchization, characteristics, FUZZY, classification*

In practice we often find ourselves placed in situations in which we need to create a classification or hierarchy for different institutions, fields of activity, activities, companies etc., even though the terms of comparison which we can dispose may lack the required specificity that can guarantee a clear differentiation. At the same time we might have more parameters that, in an individual or group analysis, may help in establishing a hierarchy. In this kind of situations the hierarchies/classifications will not be identical, case in which establishing the order of classification will not be possible.

In solving this issue we can make use of one of the mathematic methods available for researchers, one that is easy to handle and implement by other individuals, with superior training in different fields that deal with mathematics on a regular level (engineers, economists, mathematicians, etc), the FUZZY method of function implementation.

According to the definitions provided by trained specialists, the FUZZY functions are “informatics components, called through info modules (LEGO type subsystems), in which the different subsystems can be combined as to create informational parsing system with different interpretations”.

The analyzed indicators used to establish hierarchies via the FUZZY functions, through implementation and processed, result in minimum values (Xmin), maximum values (Xmax), intermediate (Xinterm) and/or no intermediate (NUINT), as follows:

$$Xmin\ j = \min_{i}(X\ ij);\ X\ m = \min(X), \text{ with } m(X) = Xm/X$$

$$Xmin\ j = \max_{j}(X\ ij);\ M(X) = X/Xm, \text{ with } X\ m = \max(X).$$

$$X\ min\ ij < X\ int\ j < X\ max\ j$$

with $i \ \Xi\ N^*, i) 1, ..., d, \ j) 1, ..., q$

in which i – may represent the products, services, ideas, units etc., that were taken into consideration

j – represent the qualities or indicators/criteria/characteristics that are taken into consideration in order to establish the hyerachies.

The theoretical problem has been solved by field specialists, and the most commonly met application domains are in marketing and bussines management, in order to establish bussines opportunities.

The method may be adapted to other domains, such as in the media, sports or even in the infrastructure of different organizations or corporations for the clasiffication of different activities, departaments etc., the only mandatory condition being the existence of more than one criterias/indicators/characteristics on which real comparisons can be made, in identical conditions of aproximation.

For example, we will try to establish a scale of importance for some Ministries, based on a certain number of criterias, chosen by us. In selecting the certain criterias we had in mind, as shown before, the permissibility of comparison in the condition of «equal chances».

We will consider a small number of domains (in this case Ministries) and a sufficient number of criterias for enabling a clear difference of the results in a direct aproach upon them.

We have assigned the Ministies A, B, C, D and E and the following criterias:

- The BVC procent from the annual PIB
- The proportion between the medium number of employees with superios studies and the total number of employees, in procents
- The number of directly subordonated subunities
- The number of legislative initiatives/ laws that were promoted in the last 2 years is an optimum for a maximum value

We consider the establishment of corect hyerarchies among unities (Ministries) possible, acknowledging characteristics such as the ones mentioned before, expressed by means of economical data, personnel data or procents resulted from uzual statistic relations as presented in table 1:

We have placed the decissional objectives "i" on the first column (The A,B,C,D and E ministries) and the "j" caracteristics on the following columns,linked to each ministry

The Xij atributies of the decisional objectives follow the FUZZY functions that are built in conformity to the affiliated logic, thus becoming the attribution of those particular values in relation with the ideal values we have taken into account.

Fuzzy function application table of data

Tabel 1

Indicator / Ministry	% BVC from PIB annual	% sup. studies employees	No. of subord. subunit	No. Legislat. init./laws	Observations
A	5	83	50	4	
B	2,2	39	34	2	
C	3,8	47	74	1	
D	4,1	42	65	4	
E	0,6	22	90	1	
Ideal level X	X med	X max	X med	X max	

Observing table 1 we will see that:

1. On the second column , the ministry classification is : B, C, E, D şi A;
2. On the third column the objective classification is : A, C, D, B şi E;
3. On the forth column , the objective classification is : D, C, A, E şi B;
4. On the fifth column , the objective classification is: A şi D, B, C şi E.

If we consider the first tabel a competitive comparison matrix ,we will create the following matrixes, granting hyerarchization points for every cryteria

We have inserted in the second table the results of the calculations done with the values obtained on the first table. We have inserted the obtained values in their coresponding place. For the second and forth columns, where the ideal level for X is the average for the result, we can use the following formula: Xi = 2*Xij*Xmed / (Xij*Xij+Xmed*Xmed)

- For the third and fifth column we can divide the value is Xij
- pentru coloanele 3 şi 5 se împarte valoarea Xij la valoarea maximă Xmax.

Normalizing (attributes with equal weights)

Tabel 2

	% BVC from the annual PIB	% pers. with supp. studies	No. subordinate subunits	No legal initiatives	TOTAL
A	0.737	1.000	0.967	1.000	3.704
B	1.000	0.470	0.821	0.500	2.791
C	0.867	0.566	0.992	0.250	2.675
D	0.833	0.506	1.000	1.000	3.339
E	0.508	0.265	0.949	0.250	1.972
Ideal level for X	X med	X max	X med	X max	

Thus, in the second table we see the situation that would be possible if all the important criteria are equal.

In the third table the calculations were done based on the assumption that the bigest weight should be assigned as follows:

- % BVC from anual PIB = 0,5
- % pers with sup studies. = 0,2
- Nr.of legal initiatives = 0,2
- Nr. subunit. subordonate = 0,1

Total = 1,0

The classification table based on the FUZZY functions

Tabel 3

	% BVC from the annual PIB	**% pers with supp. studies**	**No. subordinate subunits**	**No legal initiatives**	**Hierarchization indicator**
A	0.369	0.200	0.097	0.200	0.865
B	0.500	0.094	0.082	0.100	0.776
C	0.434	0.113	0.099	0.050	0.696
D	0.417	0.101	0.100	0.200	0.818
E	0.254	0.053	0.095	0.050	0.452
weight 1 X	0.5	0.2	0.1	0.2	

Table three shows:

5. On the second column , the ministry classification is: B, C, D, A şi E;
6. On the third column , the ministry classification is : A, C, D, B şi E;
7. On the forth column , the ministry classification is : D, C, A, E şi B;
8. On the fifth column, the ministry classification is: A şi D, B, C şi E.

Out of the sum of the horizontal results and regarding al the characteristics and criterias, we can determine a classification for the ministries as :**A, D, B, C and E.**

In order to observe the importance of establishing the correct weights of the criterias, we will show the same calculas done if the weight is different, using the following order:

- % pers. with supp. studies. = 0,4
- No legal initiatives = 0,3
- % BVC from the annual PIB = 0,2
- No of subordinate units = 0,1

Total = 1,0

The level we assign ot each criteria sets the order in which the objectives are classified - Tabel 3, this time different - Tabel 4

Out of the sum of the horizontal results and regarding al the characteristics and criterias, we can determine a classification for the ministries as **A, C, B, D şi E.**

With this example we have tryed to show the uses of the FUZZY functions and the importance of chosing the right and comparable criterias, having assigned their weights to a value as close to reality as possible, when using the method in establishing a hyerarchi.

Table of classification with fuzzy functions

Tabel 3

	% BVC from the annual PIB	% pers. cu studii sup.	No. subordinate subunits	No legal initiatives	Hierarchization indicator
A	0.147	0.400	0.097	0.300	0.944
B	0.200	0.188	0.082	0.000	0.470
C	0.173	0.227	0.099	0.000	0.499
D	0.167	0.202	0.100	0.000	0.469
E	0.102	0.106	0.095	0.000	0.302
ponderi 2 X	0.2	0.4	0.1	0.3	

The novelty of this research is that we have found a different way to determine the necessary hyerarchies at a certain time , basing our findings on analysis and scientific calculations.Thus, basing our findings on established criterias we have determined a "classification" of some ministries , which we can only determine in aproximation if we base our work on assumptions and/or experience

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