Scientific Papers (www.scientificpapers.org)
Journal of Knowledge Management, Economics and Information Technology

Vol. V, Issue 2
April 2015

The Exercise of Prediction Process of Performance within Football Sports Management by Using Fuzzy Logic from the Perspective of Value Analysis on Tactical Compartments of Game of the Football Players

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Keeping in mind the conditions of an ever more pronounced increase of the diversity and complexity of the economical field, regarding supplying service goods from entities as well as regarding the social or image aspect correlated with expectancies of stakeholders which gravitate around these, the professionalization of organization management has become a primordial condition in order to reach economical as well as social and ecological performances or regarding their image or their reputation. In this context whether we refer to classical economical organizations or sports, cultural or of another field, implementing within the aforementioned of a performing management structured on rigorous mathematics founded methodologies for solving, anticipating or forecasting different problems encountered in their existence, represents a growth of professionalization level of management and implicitly of organizational performances, regardless of their type. Thus the present article is set on supplying the theoretical and practical framework for exercising the forecasting process of performance within football sports management by the prism of prediction of a football team's place in the ranking of a national championship, regardless of the country or division, with the help of a modern methodology founded on mathematics which has at its

foundation the fuzzy logic. Particularly, the proposed fuzzy methodology will applied in a concrete and exemplifying way within a third league football club in Romania, with the name F.C. Nuova Mama Mia Bechicerecu Mic, of Timiș county, mentioning the existing possibility of its application within any other football or other collective sports club and why not even within economical entities, under the condition of a pertinent and realist appraisal of entry data in the suggested fuzzy algorithm.

Keywords: *prediction, sports performance, football club, fuzzy logic.*

Introduction

During the contemporary period physical activity in general and sports practiced amateurishly or professionally especially have become ever more current and debated in different mass-media environments an not only, arousing interest in common people as well as those truly involved in this phenomenon. Seeing such, sporting organizations as classical economical organizations tend to make increasing efforts for attaining organizational performances, be it economical, sporting, of image and so on. A direction as such has imposed the management of sports organizations the professionalization of all activities which gravitate around the sporting phenomenon and implicitly applying in a performing and professional way of all management functions, of organization, planning, coordination, forecasting and review-evaluation.

Thus for any economical entities in general or of another orientation as are the sports ones, have to orientate especially towards reaching performance and implicitly ensuring sustainability, adopting some modern and flexible instruments by using math-founded methodologies to catalyze the organizational success represents an important leverage for development on all planes. This aspect is the more important as the current environment in which organizations evolve is most times an uncertain one, surrounded by ambiguity and which constraints the adoption of uncertain decisions by decision factors, especially if these situations are doubled by the subjective rationality of the decision makers which most times express themselves through vague expressions, qualitative, and not through classical

logic. In this context adopting a methodology and technique based on the fuzzy logic, which is a logic of nuance, much more malleable as classical logic, allows the organization to frame a much more uncertainty-free and safe future, especially because of facilitating leadership factors regarding the adoption of much more viable, safe and efficient decisions and in the fastest possible pace. Thus the present article is set on supplying the theoretical and practical framework for exercising the forecasting process of performance within football sports management by fuzzy logic from a perspective of value analysis on tactical game compartments of football players which regards the prediction of the susceptible position to be occupied by a football team at the end of a championship. The algorithm or fuzzy methodology proposed in the third chapter of this research article is one especially flexible and realist based and adapted starting from a study in specialized literature of Serbian researchers Pešić et al. (2012), in which they have proposed a new strategically instrument to carry out the internal audit of a country using fuzzy logic.

Literature review

As far as specialized literature corroborated with the application of fuzzy logic in sporting organizations management and not solely, this is one of the vastest. Thus, Herm et al. (2014) proposed an econometric model in order to evaluate athletes of football players through the prism of two perspectives: the variables are directly linked to the gamer's talents and the variables which derived from judging of external sources, as are for example journalists, meanwhile Bai et al. (2014) integrates fuzzy means in TOPSIS in order to evaluate organizational performance.

From a more complex and profound perspective, namely that of strategic management, Minin et al. (2014) approaches the issue of strategic agility within the Italian football club Udinese with an eye to achieving good performances from a sports point of view as well as financial one, meanwhile Marcu and Buhas (2014) highlight the primordial importance of professionalizing sports management to catalyze financial performance as well as sporting performance of organizations from sports industry.

As important is also the approach by researchers Tavana et al. (2013) which use a system of fuzzy inference to select football players and form a team in collective sports. In the same context but regarding the king of

sports which we are referring in this research material, namely football, Molcuț and Sîrb (2014a) approach the issue of human resources management from a fuzzy logic perspective in football clubs as beeing an important catalyst in facilitating the equilibrium between high sporting performance and high financial performance. In the same context, in another research material, Molcuț and Sîrb (2014b) highlight the management implications of fuzzy logic in the process of sorting children and juniors within a football club.

Research Methodology

As I have mentioned in the introductory chapter, the fuzzy algorithm or methodology regarding exercising the forecasting process of performance within football sports management by fuzzy logic from a value analysis perspective on game tactical compartments of football players through the prism of the position susceptible to being held by a team in the final rank of a football championship, is an extremely flexible and objective one, modelled and adapted starting from a study of specialized economical literature of Serbian researchers Pešić et al. (2012), in which they have proposed a new strategically instrument to carry out the internal audit of a company using fuzzy logic.

In this sense, seeing things from a logical point of view and in a football manner, it's normal that as the value of a team's gamers is higher, the team's position of which the football players are part of must reflect as possible their football quality, so from this point of view the recruiting or selection process of the football players within a football team becomes a primordial step in achieving sporting performance in football clubs. In this sense, Tavana et al. (2013) mentions the fact that the selection process of football players for the purpose of forming a team in collective sports represents a complex multi-criteria problem which involves conflicting objectives. In this ensemble some trainers use proportions of importance in determining the impact of every selection criteria or attribute considered, since these indicate the way in which the impact of a particular attribute determines the probability of a successful result. Thus the fuzzy logic represents a powerful mathematical instrument for modelling unsure systems in general, those correlated to sporting branches as well as industrial ones, human and natural, acting as an efficient catalyst in decision

making through approximate rationalities and linguistic terms, more so as sports management in particular and economical one in general often involve making a decision in the absence of precise and complete information.

In this context, in connection to the process of making the most efficient and efficacious decisions, a special importance in exercising management of an organization is the forecasting process of results susceptible to performance following the adoption in some circumstances of the managerial decision making process. Thus, seeing to the closing or finale of the multi-criteria selection decision making process regarding selection of football players from the perspective of forming a competitive football team which moreover represents a primordial direction within a football club towards reaching its sporting performance, financial or of image (Molcuț and Sîrb, 2014a), complementary to this aspect, of special importance for the management of a sporting entity remains the forecasting of sports performance of the latter, from a sports point of view primarily, this aspect being regarded especially through the prism of value analysis by positions of football players and respectively of corresponding tactical compartments from which these pertain.

Thus we will take into consideration the analysis or evaluation one at a time of two primordial aspects in carrying out this forecast process or prediction, respectively evaluating the share of importance of performance criteria corresponding to each tactical compartments and secondly evaluation of satisfaction degree of each tactical compartment regarding each corresponding performance criteria. In this sense the steps of multi-criteria fuzzy methodology regarding exercising the forecasting process of performance within football sports management through fuzzy logic from the perspective of value analysis on tactical game compartments of football players is shown as follows:

1. Establishing performance criteria corresponding to value analysis on those l tactical game compartments of players where $l=1,...,6$, respectively goal keeper, center defender, side defender, central midfielder, side midfielder and forward and by allocating a share of importance to these by a value comprised in the range of [0,2] and noted with α_i, $i=1,...,n$.

2. Evaluating the satisfaction degree of each football player regarding each performance criteria afferent to value analysis on each tactical game compartment of which these pertain by a value within the range of [0,5]. In this sense be it C_i, $i=1,...,n$ the criteria which are relevant and determinant to each tactical compartment individually. Evaluating the satisfaction degree of each football player regarding each performance criteria afferent to value analysis on each tactical game compartment individually is noted with $S_{j\,i}$, $i=1,...,n$, and the value j can take different values from natural numbers, depending on the number of players corresponding to each tactical compartment in a football team.
3. Calculating the degree of satisfaction on each tactical game compartment regarding each performance criteria ($G_{l\,i}$, $l=1,...,6$, $i=1,...,n$) so as the arithmetic average of the assigned values as a result of evaluation of satisfaction degrees from the previous step, of each player pertaining to each tactical compartment regarding each performance criteria.
4. In this context, four fuzzy sets are defined: $\overline{FS1}$ - "Fuzzy set 1", $\overline{FS2}$ - "Fuzzy set 2", $\overline{FS3}$ - "Fuzzy set 3" and $\overline{FS4}$ - "Fuzzy set 4". Depending of the satisfaction degree of each game compartment regarding each performance criteria pertaining to it, the degree of correspondence of the degree of satisfaction of each game compartment to each of the four fuzzy sets defined earlier will be calculated.

Graphic representation of the fuzzy sets defined is framed in fig. 1, where it can be noted that the evaluation of the satisfaction degree of a certain tactical compartment regarding each performance criteria pertaining to that compartment can at the same time belong to $\overline{FS1}$, as well as $\overline{FS2}$ (to different extent), these evaluations being attained following fuzzy scores assigned accordingly to subjective rationalization of the human factor. For example the satisfaction degree $G_{l\,i}$ in fig. 1 belongs to set $\overline{FS1}$ with a $\mu_{1\,i}$ degree of belonging, at the same belonging to set $\overline{FS2}$ with the belonging degree $\mu_{2\,i}$.

It has to be mentioned that the sum of all degrees of belonging to the four fuzzy sets pertaining to the satisfaction degree of the compartment taken into account regarding each corresponding performance criteria must be equal to *1*. Thus for each criteria C_i

$$\sum_{k=1}^{4} \mu_{k\,i} = 1 \qquad (1)$$

Demonstration: As we are using triangular fuzzy sets for a satisfaction degree with a value x, the belonging function $\mu_{1\,i}$ equals *1* for x belonging to range $[0,1]$. Moving on, $\mu_{1\,i}(x) = -x + 2$ is valid for $x \in [1,2]$ and is equal to *0* in range $[2,4]$. Similarly, $\mu_{2\,i}(x) = x - 1$ is valid for $x \in [1,2]$ as well as $\mu_{2\,i}(x) = -x + 3$ for $x \in [2,3]$. Therewith, $\mu_{2\,i}(x) = 0$ for $x \notin [1,3]$.

Similarly we obtain the formulas for other belonging functions.

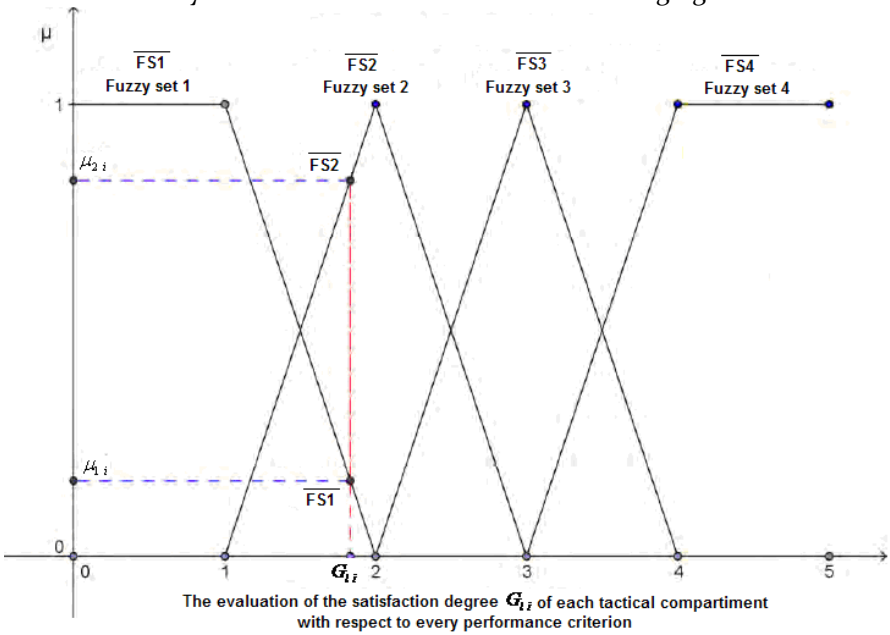

Figure 1: Projecting fuzzy sets pertaining to evaluation of the satisfaction degree of each tactical compartment regarding each performance criteria

If the value of the satisfaction degree is from *0* to *1*, the belonging degree to the fuzzy set $\overline{FS2}$ is equal to *1* and for all the other fuzzy sets it is equal to *0*. If the value pertains to range $[1,2]$, then by graphic symmetry of the functions that represent the fuzzy sets $\overline{FS2}$ and $\overline{FS1}$ regarding line $\mu = 0.5$, the degree of belonging to set $\overline{FS1}$ is equal to *1* minus the degree of belonging to set $\overline{FS2}$, and the degree regarding the other two remaining sets is equal to *0*. We can demonstrate the above also using the above formulas for fuzzy sets represented by $\overline{FS1}$ and $\overline{FS2}$. For example a satisfaction degree $G_{l\,i}$, $l = 1,...,6$, $i = 1,...,n$ with value $x \in [1,2]$, we obtain:

$$\mu_{1\,i}(x) + \mu_{2\,i}(x) = (-x+2) + (x-1) = 1 \qquad (2)$$

Parallel, we note that in the range $[2,3]$, only two degrees of belonging are different from 0 ($\overline{FS2}$ şi $\overline{FS3}$) and their sum is equal to 1. In the range $[3,4]$, the graphic of functions $\overline{FS3}$ şi $\overline{FS4}$ are symmetrical regarding line $\mu = 0.5$, thus the sum of the corresponding degrees of belonging equals 1 and the other two degrees equal 0. We can demonstrate these last affirmations using as well the formulas for the triangular fuzzy sets. Finally in the range $[4,5]$ only the degree of belonging of $\overline{FS4}$ is equal 1 and the others are equal to 0. Thus along the whole of the field the sum of the degrees of belonging is equal to 1.

The same procedure is applied to all evaluation of the satisfaction degree of each tactical compartment regarding each corresponding performance criteria respectively $G_{l\,i}$, $l = 1,...,6$, $i = 1,...,n$, so as depending on the value which belongs to range [0,5] these satisfaction degrees belong with a certain degree of belonging to the four fuzzy sets. As a consequence all arguments from the demonstration in the paragraphs above have been synthesized in four synthetic formulas which represent a plus of added value within this phase as against the explanations offered within Pešić et al.'s study (2012) in the sense of facilitating the improvement of user comprehension of this mathematical fuzzy instrument regarding the determination in a as simple and objective way as possible of degrees of belonging of the satisfaction degree of each tactical compartment regarding

each performance criteria pertaining to fuzzy sets $\overline{FS1}$, $\overline{FS2}$, $\overline{FS3}$ și $\overline{FS4}$, as follows:

$$- \mu_{1\ i}(x) = \begin{cases} 1, & x \in [0,1] \\ -x+2, & x \in [1,2] \\ 0, & x \in [2,5] \end{cases} \rightarrow \text{For } \overline{FS1};$$

(3)

$$- \mu_{2\ i}(x) = \begin{cases} 0, & x \in [0,1] \\ x-1, & x \in [1,2] \\ -x+3, & x \in [2,3] \\ 0, & x \in [3,5] \end{cases} \rightarrow \text{For } \overline{FS2};$$

(4)

$$- \mu_{3\ i}(x) = \begin{cases} 0, & x \in [0,2] \\ x-2, & x \in [2,3] \\ -x+4, & x \in [3,4] \\ 0, & x \in [4,5] \end{cases} \rightarrow \text{For } \overline{FS3};$$

(5)

$$- \mu_{4\ i}(x) = \begin{cases} 0, & x \in [0,3] \\ x-3, & x \in [3,4] \\ 1, & x \in [4,5] \end{cases} \rightarrow \text{For } \overline{FS4}.$$

(6)

5. The data obtained as a result of following steps 1, 2, 3 and 4 pertaining to each tactical compartment regarding each performance criteria from the tactical distribution are present in table 1.

Table 1: The degrees of belonging to each of the four fuzzy sets of the values of satisfaction degrees of each tactical compartment regarding each performance criteria respectively and the share of importance of the criteria

Satisfaction degrees of each tactical compartment $G_{l\,i}$, $l=1,...,6$, $i=1,...,n$	Degrees of belonging to the four fuzzy sets				Proportion of importance of performance C_i criteria α_i, $i=1,...,n$
	$\overline{FS1}$	$\overline{FS2}$	$\overline{FS3}$	$\overline{FS4}$	
$G_{l\,1}$	$\mu_{1\,1}$	$\mu_{2\,1}$	$\mu_{3\,1}$	$\mu_{4\,1}$	α_1
$G_{l\,2}$	$\mu_{1\,2}$	$\mu_{2\,2}$	$\mu_{3\,2}$	$\mu_{4\,2}$	α_2
$G_{l\,3}$	$\mu_{1\,3}$	$\mu_{2\,3}$	$\mu_{3\,3}$	$\mu_{4\,3}$	α_3
...	...	...	...	...	...
$G_{l\,n}$	$\mu_{1\,n}$	$\mu_{2\,n}$	$\mu_{3\,n}$	$\mu_{4\,n}$	α_n

6. Multiplying the degrees of belonging to the four fuzzy sets with the proportion of importance of performance criteria for each tactical compartment in part, we obtain the weighted fuzzy degrees of belonging as according to table 2 from below.

Table 2: Weighted fuzzy degrees of belonging

Satisfaction degrees of each tactical compartment $G_{l\,i}$, $l=1,...,6$, $i=1,...,n$	$\overline{FS1}$	$\overline{FS2}$	$\overline{FS3}$	$\overline{FS4}$
$G_{l\,1}$	$\alpha_1\ \mu_{1\,1}$	$\alpha_1\ \mu_{2\,1}$	$\alpha_1\ \mu_{3\,1}$	$\alpha_1\ \mu_{4\,1}$
$G_{l\,2}$	$\alpha_2\ \mu_{1\,2}$	$\alpha_2\ \mu_{2\,2}$	$\alpha_2\ \mu_{3\,2}$	$\alpha_2\ \mu_{4\,2}$
$G_{l\,3}$	$\alpha_3\ \mu_{1\,3}$	$\alpha_3\ \mu_{2\,3}$	$\alpha_3\ \mu_{3\,3}$	$\alpha_3\ \mu_{4\,3}$

...	...	...	...	...
$G_{l\,n}$	$\alpha_n\ \mu_{1\,n}$	$\alpha_n\ \mu_{2\,n}$	$\alpha_n\ \mu_{3\,n}$	$\alpha_n\ \mu_{4\,n}$

7. With the purpose of determining the result of the final solution regarding the forecast of performance within football sports management through fuzzy logic from value analysis perspective on game tactical compartments of players, the next step will consist of calculating the average sum of weighted fuzzy degrees of belonging of each of the four columns corresponding to these fuzzy sets. For the first two sets the average sum of the weighted fuzzy degrees of belonging is taken with a negative sign (because it represents the weakness of the tactical compartment) and for the other two fuzzy sets, with positive sign (because it represents the force of the tactical compartments). Moreover the average sum of the weighted fuzzy degrees of belonging at $\overline{FS1}$ and $\overline{FS4}$ are multiplied by 1.5, increasing their influence in the total sum or in the final result of the multi-criteria fuzzy prediction because it expresses a great weakness and a great force (table 3). The 1.5 factor is an empirical value which is chosen to underline the major weakness and force of each tactical compartment.

Summing the values of the last line of table 3 we obtain a real solution marked with $\Pr ediction_{sucess}$, which indicates the final result regarding the prediction or forecast of performance within football sports management by fuzzy logic from a value analysis perspective on game tactical compartments of players.

$$\Pr ediction_{success} = -(1.5)\sum_{i=1}^{n}\frac{\alpha_i\mu_{1\,i}}{n} - \sum_{i=1}^{n}\frac{\alpha_i\mu_{2\,i}}{n} + \sum_{i=1}^{n}\frac{\alpha_i\mu_{3\,i}}{n} + (1.5)\sum_{i=1}^{n}\frac{\alpha_i\mu_{4\,i}}{n} \quad (7)$$

Table 3: Weighted average sum of degrees of belonging

Satisfaction degrees of each tactical compartment $G_{l\,i}$, $l=1,...,6$, $i=1,...,n$	$\overline{FS1}$	$\overline{FS2}$	$\overline{FS3}$	$\overline{FS4}$
$G_{l\,1}$	$\alpha_1\ \mu_{1\,1}$	$\alpha_1\ \mu_{2\,1}$	$\alpha_1\ \mu_{3\,1}$	$\alpha_1\ \mu_{4\,1}$
$G_{l\,2}$	$\alpha_2\ \mu_{1\,2}$	$\alpha_2\ \mu_{2\,2}$	$\alpha_2\ \mu_{3\,2}$	$\alpha_2\ \mu_{4\,2}$
$G_{l\,3}$	$\alpha_3\ \mu_{1\,3}$	$\alpha_3\ \mu_{2\,3}$	$\alpha_3\ \mu_{3\,3}$	$\alpha_3\ \mu_{4\,3}$
...	...	...	...	...
$G_{l\,n}$	$\alpha_n\ \mu_{1\,n}$	$\alpha_n\ \mu_{2\,n}$	$\alpha_n\ \mu_{3\,n}$	$\alpha_n\ \mu_{4\,n}$
$\Pr ediction_{success}$	$-(1.5)\sum_{i=1}^{n}\frac{\alpha_i\mu_{1\,i}}{n}$	$-\sum_{i=1}^{n}\frac{\alpha_i\mu_{2\,i}}{n}$	$\sum_{i=1}^{n}\frac{\alpha_i\mu_{3\,i}}{n}$	$(1.5)\sum_{i=1}^{n}\frac{\alpha_i\mu_{4\,i}}{n}$

The value $\Pr ediction_{success}$ will be a real number from the reference range $[-3,3]$. In this context the sporting performance susceptible to being accomplished by a football team through the prism of value analysis on tactical game compartments of the players will be mirrored by the place held in the final ranking of a football championship by that team. In this context the reference range of which I was referring previously respectively $[-3,3]$, will be divided into equal parts equivalent in number with the number of teams composing the football championship which activates the team subjected to the process of prediction of sporting performance. It can be determined in this way, in a manner which is as pertinent and realist as possible the potential sporting performance to be realized by a football team in a championship from the prism of the place occupied by that team in the final rankings, an aspect which otherwise would be tangible and demonstrated by example in the study case of the next chapter.

Case study

As mentioned in the introductory part of this article, the fuzzy methodology proposed in the previous chapter regarding the managerial process of

forecasting sports performance will be applied in a concrete and illustrative way within a third league football club from Romania, called F.C. Nuova Mama Mia Bechicerecu Mic, of Timiş county, mentioning the existing possibility of its application within any other football or other collective sports club and why not even within prediction of performance in any type of economical entities or of other profile, under the condition of a pertinent and realist appraisal of entry data in the suggested fuzzy algorithm.

It must be underlined that in the case of the case study in this chapter the evaluations of entry data within the proposed fuzzy methodology have been made through the method of observation and analysis, the data being collected and refined during a period of observation of approximately one month before the starting of the competition season 2014-2015, during which the trainings and friendly matches of the team on which the study has been performed have been viewed and monitored in order to obtain a most objective appraisal of the data.

In these conditions according to step 1) of the fuzzy methodology proposed in the previous chapter the performance criteria will be established pertaining to each tactical compartment and also their respective importance weight will be determined as in table 4 below.

Table 4: Establishing the performance criteria pertaining to each tactical compartment and determination of their respective weighted importance

Tactical compart.	Performance criteria by tactical compartments of game	Proportion of importance of performance C_i criteria [0,2].
Goalkeeper	C_1 - to lead the team with guidances;	**1.2**
	C_2 - to accomplish the technical aspects specific to their position;	**1.8**
	C_3 - to have an advanced position on the attack of their own team - libero;	**1**
	C_4 - to give confidence to colleagues.	**1.5**
	C_5 - to mark strictly to the most advanced adversary forward;	**1.4**

Central defender	C_6 - to permanently dribble;	**1.9**
	C_7 - to double the side defenders on their side;	**1.8**
	C_8 - to perform headers well;	**1.9**
	C_9 - to precisely launch the suitable tip;	**1.2**
	C_{10} - to win one on one duels;	**2**
	C_{11} - to form a couple.	**1.5**
Side defender	C_{12} - to be capable of repeatedly executing crosses of 8om;	**1**
	C_{13} - to cover their area in any moment of the game;	**1.6**
	C_{14} - to mark only towards the adversely of their area when the ball has entered their half of the field;	**0.5**
	C_{15} - to make an anticipate mark when the ball is in the opposing half;	**0.7**
	C_{16} - to dribble their compartment colleagues when the attack of the opponents is led on the opposing side;	**2**
	C_{17} - to not allow the adversary to play center in their area;	**2**
	C_{18} - to win one on one duels;	**1.9**
	C_{19} - to perform rejections with headers precisely;	**1.6**
	C_{20} - to play center well.	**1.8**
Central midfielder	C_{21} - to perform recovery well;	**1.8**
	C_{22} - to have a prominent tactical sense;	**1.9**
	C_{23} - to recover balls rejected by defenders;	**1.6**
	C_{24} - to close central pathways;	**1.9**
	C_{25} - to close side areas when the side defenders are found advanced;	**0.5**
	C_{26} - to win one on one duels;	**1.5**
	C_{27} - to not allow opposing midfielders to directly pass the ball;	**1.8**
	C_{28} - to put pressure on the opposition's middle line;	**1.2**

	C_{29} - to have a good game technique;	**2**
	C_{30} - to play in a couple (for dribbling);	**1.6**
	C_{31} - to remain always in synchronization when the team is in offensive;	**1.4**
	C_{32} - to shoot well at a distance;	**1.7**
	C_{33} - to launch tips auspiciously;	**1.9**
	C_{34} - to have a lot of personality.	**1.5**
Side midfielder	C_{35} - to be capable of repeatedly executing crosses;	**1.8**
	C_{36} - to cover their area in defensive phase;	**1.8**
	C_{37} - to "gather" on the inside when the attack of the opponents is led on the opposing side;	**1.9**
	C_{38} - to win one on one duels (defensive-offensive);	**1.7**
	C_{39} - to not allow the adversary to play center from their area;	**1.6**
	C_{40} - to demarcate (to disperse) to the side when their own offensive action is led to their area;	**1.5**
	C_{41} - to penetrate in anticipation from the exterior towards the interior in order to receive a vertical pass;	**1.5**
	C_{42} - to gather in the interior alongside the central midfielder in order to crowd the central area in the defense phase;	**1.9**
	C_{43} - to be skilled technicians;	**2**
	C_{44} - to play center precisely.	**1.9**
	C_{45} - to master the distance strike;	**1.7**
	C_{46} - to have personality.	**1.5**
	C_{47} - to be capable of repeatedly executing crosses;	**1.4**
	C_{48} - to have the capacity for effort and the necessary qualities to perform the defense phase;	**1.5**
	C_{49} - to win one on one duels;	**2**

Forward	C_{50} - to have a good demarcation capacity and science in order to receive a pass;	**1.9**
	C_{51} - to be technicians;	**1.7**
	C_{52} - to have a good header or détente and a precise strike from a distance as well as from near the gate;	**2**
	C_{53} - to have personality.	**1.6**
	C_{54} - to be speculative in front of the gate	**1.9**

As it can be noted from the previous table as well as it has been mentioned in the previous chapter during the football game there are six tactical game compartments of players, respectively the goalkeeper's, central defender, side defender, central midfielder, side midfielder and forward, each of these having allocated a certain number of performance criteria, which can be seen in fig. 2 below where a distribution or a tactical game system of the type "1-4-4-2" can be noted, respectively goalkeeper, two central defenders, two side defenders, two central midfielders, two side midfielders and two forwards.

Figure 2: Graphic representation of the tactical game system of the type "1-4-4-2" with tactical compartments and respective performance criteria

Besides the performance criteria described by table 4 and fig. 2 in order to reach sports performance at the end of the championship, we consider that a football team should comply and achieve cumulative and generally the following objectives:

- to understand and respect exactly the game concept and the coach's tactic;
- to commit completely even to sacrifice in the official game;
- to have a winner's mindset;
- to respect itself in any situation;
- to treat the first game as if it were the last of its career.

The following step in the process of achieving the objective of this research material is the equivalent of steps two and three of the fuzzy methodology described in the previous chapter, respectively evaluation of the satisfaction degree of each football player regarding each performance criteria pertaining to the value analysis on each tactical game compartment of which they belong to and respectively, calculating the satisfaction degree on each tactical game compartment regarding each performance criteria as the average sum of values given as a result of evaluation of satisfaction degrees of each player pertaining to each tactical compartment regarding each performance criteria. The data and results pertaining this step can be visualized in tables 5, 6, 7, 8, 9 and 10 below.

Table 5: Evaluation the satisfaction degrees of players within the goalkeeper tactical compartment and respectively calculating the satisfaction degree of the aforementioned compartment regarding each pertaining performance criteria.

Name of goalkeeper	Satisfaction degree of the player regarding each performance criteria for the goalkeeper tactical compartment [0,5]			
	C_1	C_2	C_3	C_4
Culda	3.7	4.2	3.4	4.5
Filip	3.5	4.4	3.6	4.5
Banică	4.2	4	3.3	4.5
Satisfaction degree goalkeeper compartment	**3.8**	**4.2**	**3.43**	**4.5**

Table 6: Evaluation of the satisfaction degrees of players within the central defender tactical compartment and respectively calculating the satisfaction degree of the aforementioned compartment regarding each pertaining performance criteria.

Name of central defender	Satisfaction degree of the player regarding each performance criteria for the central defender tactical compartment [0,5]						
	C_5	C_6	C_7	C_8	C_9	C_{10}	C_{11}
Telescu	4.3	4.5	4.5	5	4	4.6	4.8
Toma	4.8	4.7	4.5	4.7	3.8	4.6	4.7
Hecsko	4.1	4.3	4.4	4.6	4.2	4.3	4.5
Hromei	4	4.4	4.4	4.7	3.6	4	4.3
Satisfaction degree central defender compartment	**4.3**	**4.48**	**4.45**	**4.75**	**3.9**	**4.38**	**4.58**

Table 7: Evaluation of the satisfaction degrees of players within the side defender tactical compartment and respectively calculating the satisfaction degree of the aforementioned compartment regarding each pertaining performance criteria.

Name of side defender	Satisfaction degree of the player regarding each performance criteria for the side defender tactical compartment [0,5]								
	C_{12}	C_{13}	C_{14}	C_{15}	C_{16}	C_{17}	C_{18}	C_{19}	C_{20}
Negruț	4.5	3	3.5	4	4.1	3.9	4.4	3.8	4.4
Nagy	4	3.8	3.7	4.2	4.2	3.8	4.1	3.7	4.1
Ștefanovici	4.1	3.6	3.5	4.4	4.2	3.9	4.2	3.8	4.5
Buzdugan	3.4	2.8	3	3.8	3.7	3.5	3.9	3.2	4
Satisfaction degree side defender compartment	**4**	**3.3**	**3.43**	**4.1**	**4.05**	**3.78**	**4.15**	**3.63**	**4.25**

Table 8: Evaluation of the satisfaction degrees of players within the central midfielder tactical compartment and respectively calculating the satisfaction degree of the aforementioned compartment regarding each pertaining performance criteria.

Name of central midfielder	Satisfaction degree of the player regarding each performance criteria for the central midfielder tactical compartment [0,5]													
	C_{21}	C_{22}	C_{23}	C_{24}	C_{25}	C_{26}	C_{27}	C_{28}	C_{29}	C_{30}	C_{31}	C_{32}	C_{33}	C_{34}
Luță	4.5	4.2	3.8	4	3.7	3.9	3.5	3.7	3.9	4.6	4.2	3.8	3.5	3
Zurbagiu	4.5	4.1	4.2	4	3.8	4.3	3.7	3.8	3.9	4.6	3.8	3.9	3.7	3.7
Postolache	3	3.5	3.2	3.6	2.4	2.6	3.1	3.5	4	3	3.7	3.8	3.9	3.7
Voicu	3.5	3.9	3.6	4	3.6	3.9	3.2	3.7	4.1	3.8	3.9	4	4.2	3.6
Satisfaction degree central midfielder compart.	**3.88**	**3.93**	**3.7**	**3.9**	**3.38**	**3.68**	**3.38**	**3.68**	**3.98**	**4**	**3.9**	**3.88**	**3.83**	**3.5**

Table 9: Evaluation of the satisfaction degrees of players within the side midfielder tactical compartment and respectively calculating the satisfaction degree of the aforementioned compartment regarding each pertaining performance criteria.

Name of side midfielder	Satisfaction degree of the player regarding each performance criteria for the side midfielder tactical compartment [0,5]											
	C_{35}	C_{36}	C_{37}	C_{38}	C_{39}	C_{40}	C_{41}	C_{42}	C_{43}	C_{44}	C_{45}	C_{46}
Centea	3.1	3.5	4.3	3.7	3.4	4	3.6	3.7	4.5	4.2	4.1	4
Tabacaru	3	3.2	4.3	3.6	2.6	4.1	3.7	3.8	4.4	4	4.2	4.2
Costea	4.1	3.4	4	3.8	2.8	3.7	3.5	4	3.9	3.5	3.8	3.6
Radu	4.4	3.8	4.5	4.6	3.6	4.2	4	3.9	4.3	4	4.3	3.7
Satisfaction degree side midfielder compartment	**3.65**	**3.48**	**4.28**	**3.93**	**3.1**	**4**	**3.7**	**3.85**	**4.28**	**3.93**	**4.1**	**3.88**

Table 10: Evaluation the satisfaction degrees of players within the forward tactical compartment and respectively calculating the satisfaction degree of the aforementioned compartment regarding each pertaining performance criteria.

Name of forward	Satisfaction degree of the player regarding each performance criteria for the forward tactical compartment [0,5]							
	C_{47}	C_{48}	C_{49}	C_{50}	C_{51}	C_{52}	C_{53}	C_{54}
Molcuț	4	3.7	3.9	4.3	3.5	4.2	3.4	4.1
Steop	3.7	3.4	4.2	4	4.1	4.4	3.8	4
Hodiș	4.2	3.9	3.5	3.8	3.1	3.7	3.2	3.8
Cioanca	3.1	2.5	3	3.3	3.1	3.4	2.5	3.5
Sturza	3.5	3	3.2	3.4	3.7	3.6	2.6	3.8
Satisfaction degree forward compartment	**3.7**	**3.3**	**3.56**	**3.76**	**3.5**	**3.86**	**3.1**	**3.84**

Moving on, depending of the satisfaction degree of each game compartment regarding each performance criteria pertaining to it, the degree of correspondence of the degree of satisfaction of each game

compartment to each of the four fuzzy sets defined earlier, respectively $\overline{FS1}$, $\overline{FS2}$, $\overline{FS3}$ and $\overline{FS4}$, will be calculated.. The four fuzzy sets to which we are referring actually encompass some linguistic appreciations which qualitatively describe and with a certain degree of belonging to them of the satisfaction degree of each game compartment regarding each pertaining criteria depending on each numerical value calculated prior as a result of making the calculation for the satisfaction degree of each tactical game compartment regarding each performance criteria, of which the pertaining calculation results can be visualized in the last rows of tables 5,6,7,8,9 and 10. In this context the four fuzzy sets are defined as follows: $\overline{FS1}$ - "High weakness", $\overline{FS2}$ - "Moderate weakness", $\overline{FS3}$ - "Moderate strength" and $\overline{FS4}$ - "Great strength".

Thus by undergoing the 4) and 5) steps of the fuzzy methodology projected in the previous chapter we will obtain the degrees of belonging to the four fuzzy sets linguistically defined previously of the values of satisfaction degrees of each tactical compartment regarding each performance criteria pertaining, distributed in the tactics. In this sense the results obtained by making the calculations according to formulas (3),(4),(5) and (6) can be viewed in table 11 below.

Table 11: The degrees of belonging to each of the four fuzzy sets of the values of satisfaction degrees of each tactical compartment regarding each performance criteria respectively and the share of importance of the criteria

Satisfaction degrees of each tactical compartment $G_{l\,i}$, $l=1,...,6$, $i=1,...,n$	Degrees of belonging to the four fuzzy sets				Proportion of importance of performance C_i criteria α_i, $i=1,...,n$
	$\overline{FS1}$ - "High weakness"	$\overline{FS2}$ - "Moderate weakness"	$\overline{FS3}$ - "Moderate strength"	$\overline{FS4}$ - "Great strength"	
$G_{1\,1}$ (Goalkeeper) = **3.8**	0	0	0.2	0.8	**1.2**
$G_{1\,2}$ (Goalkeeper) = **4.2**	0	0	0	1	**1.8**

$G_{1\,3}$ (Goalkeeper) = **3.43**	0	0	0.57	0.43	**1**
$G_{1\,4}$ (Goalkeeper) = **4.5**	0	0	0	1	**1.5**
$G_{2\,5}$ (central defender) = **4.3**	0	0	0	1	**1.4**
$G_{2\,6}$ (central defender) = **4.48**	0	0	0	1	**1.9**
$G_{2\,7}$ (central defender) = **4.45**	0	0	0	1	**1.8**
$G_{2\,8}$ (central defender) = **4.75**	0	0	0	1	**1.9**
$G_{2\,9}$ (central defender) = **3.9**	0	0	0.1	0.9	**1.2**
$G_{2\,10}$ (central defender) = **4.38**	0	0	0	1	**2**
$G_{2\,11}$ (central defender) = **4.58**	0	0	0	1	**1.5**
$G_{3\,12}$ (side defender) = 4	0	0	0	1	**1**
$G_{3\,13}$ (side defender) = 3.3	0	0	0.7	0.3	**1.6**
$G_{3\,14}$ (side defender) = 3.43	0	0	0.57	0.43	**0.5**
$G_{3\,15}$ (side defender) = 4.1	0	0	0	1	**0.7**
$G_{3\,16}$ (side defender) = 4.05	0	0	0	1	**2**
$G_{3\,17}$ (side defender) = 3.78	0	0	0.22	0.78	**2**
$G_{3\,18}$ (side defender) = 4.15	0	0	0	1	**1.9**
$G_{3\,19}$ (side defender) = 3.63	0	0	0.37	0.63	**1.6**
$G_{3\,20}$ (side defender) = 4.25	0	0	0	1	**1.8**

$G_{4\ 21}$ (central midfielder) = **3.88**	0	0	0.12	0.88	**1.8**
$G_{4\ 22}$ (central midfielder) = **3.93**	0	0	0.07	0.93	**1.9**
$G_{4\ 23}$ (central midfielder) = **3.7**	0	0	0.3	0.7	**1.6**
$G_{4\ 24}$ (central midfielder) = **3.9**	0	0	0.1	0.9	**1.9**
$G_{4\ 25}$ (central midfielder) = **3.38**	0	0	0.62	0.38	**0.5**
$G_{4\ 26}$ (central midfielder) = **3.68**	0	0	0.32	0.68	**1.5**
$G_{4\ 27}$ (central midfielder) = **3.38**	0	0	0.62	0.38	**1.8**
$G_{4\ 28}$ (central midfielder) = **3.68**	0	0	0.32	0.68	**1.2**
$G_{4\ 29}$ (central midfielder) = **3.98**	0	0	0.02	0.98	**2**
$G_{4\ 30}$ (central midfielder) = **4**	0	0	0	1	**1.6**
$G_{4\ 31}$ (central midfielder) = **3.9**	0	0	0.1	0.9	**1.4**
$G_{4\ 32}$ (central midfielder) = **3.88**	0	0	0.12	0.88	**1.7**
$G_{4\ 33}$ (central midfielder) = **3.83**	0	0	0.17	0.83	**1.9**
$G_{4\ 34}$ (central midfielder) = **3.5**	0	0	0.5	0.5	**1.5**
$G_{5\ 35}$ (side midfielder) = **3.65**	0	0	0.35	0.65	**1.8**
$G_{5\ 36}$ (side midfielder) = **3.48**	0	0	0.52	0.48	**1.8**
$G_{5\ 37}$ (side midfielder) = **4.28**	0	0	0	1	**1.9**

$G_{5\ 38}$ (side midfielder) = **3.93**	0	0	0.07	0.93	**1.7**
$G_{5\ 39}$ (side midfielder) = **3.1**	0	0	0.9	0.1	**1.6**
$G_{5\ 40}$ (side midfielder) = **4**	0	0	0	1	**1.5**
$G_{5\ 41}$ (side midfielder) = **3.7**	0	0	0.3	0.7	**1.5**
$G_{5\ 42}$ (side midfielder) = **3.85**	0	0	0.15	0.85	**1.9**
$G_{5\ 43}$ (side midfielder) = **4.28**	0	0	0	1	**2**
$G_{5\ 44}$ (side midfielder) = **3.93**	0	0	0.07	0.93	**1.9**
$G_{5\ 45}$ (side midfielder) = **4.1**	0	0	0	1	**1.7**
$G_{5\ 46}$ (side midfielder) = **3.88**	0	0	0.12	0.88	**1.5**
$G_{6\ 47}$ (forward) = **3.7**	0	0	0.3	0.7	**1.4**
$G_{6\ 48}$ (forward) = **3.3**	0	0	0.7	0.3	**1.5**
$G_{6\ 49}$ (forward) = **3.56**	0	0	0.44	0.56	**2**
$G_{6\ 50}$ (forward) = **3.76**	0	0	0.24	0.76	**1.9**
$G_{6\ 51}$ (forward) = **3.5**	0	0	0.5	0.5	**1.7**
$G_{6\ 52}$ (forward) = **3.86**	0	0	0.14	0.86	**2**
$G_{6\ 53}$ (forward) = **3.1**	0	0	0.9	0.1	**1.6**
$G_{6\ 54}$ (forward) = **3.84**	0	0	0.16	0.84	**1.9**

Further on according to step 6) of the fuzzy methodology presented in the previous chapter, multiplying the degrees of belonging to the four fuzzy sets with the proportion of importance of performance criteria for each tactical compartment in part, we obtain the weighted fuzzy degrees of belonging as according to table 12 from below.

Table 12: Weighted fuzzy degrees of belonging

Satisfaction degrees of each tactical compartment $G_{l\,i}$, $l=1,...,6$, $i=1,...,n$	Degrees of belonging to the four fuzzy sets			
	$\overline{FS1}$ - "High weakness"	$\overline{FS2}$ - "Moderate weakness"	$\overline{FS3}$ - "Moderate strength"	$\overline{FS4}$ - "Great strength"
$G_{1\,1}$ (Goalkeeper)	0	0	0.24	0.96
$G_{1\,2}$ (Goalkeeper)	0	0	0	1.8
$G_{1\,3}$ (Goalkeeper)	0	0	0.57	0.43
$G_{1\,4}$ (Goalkeeper)	0	0	0	1.5
$G_{2\,5}$ (central defender)	0	0	0	1.4
$G_{2\,6}$ (central defender)	0	0	0	1.9
$G_{2\,7}$ (central defender)	0	0	0	1.8
$G_{2\,8}$ (central defender)	0	0	0	1.9
$G_{2\,9}$ (central defender)	0	0	0.12	1.08
$G_{2\,10}$ (central defender)	0	0	0	2
$G_{2\,11}$ (central defender)	0	0	0	1.5
$G_{3\,12}$ (side defender)	0	0	0	1
$G_{3\,13}$ (side defender)	0	0	1.12	0.48
$G_{3\,14}$ (side defender)	0	0	0.29	0.22
$G_{3\,15}$ (side defender)	0	0	0	0.7
$G_{3\,16}$ (side defender)	0	0	0	2
$G_{3\,17}$ (side defender)	0	0	0.44	1.56
$G_{3\,18}$ (side defender)	0	0	0	1.9
$G_{3\,19}$ (side defender)	0	0	0.59	1
$G_{3\,20}$ (side defender)	0	0	0	1.8

$G_{4\ 21}$ (central midfielder)	0	0	0.22	1.58
$G_{4\ 22}$ (central midfielder)	0	0	0.13	1.77
$G_{4\ 23}$ (central midfielder)	0	0	0.48	1.12
$G_{4\ 24}$ (central midfielder)	0	0	0.19	1.71
$G_{4\ 25}$ (central midfielder)	0	0	0.31	0.19
$G_{4\ 26}$ (central midfielder)	0	0	0.48	1.02
$G_{4\ 27}$ (central midfielder)	0	0	1.12	0.68
$G_{4\ 28}$ (central midfielder)	0	0	0.38	0.82
$G_{4\ 29}$ (central midfielder)	0	0	0.04	1.96
$G_{4\ 30}$ (central midfielder)	0	0	0	1.6
$G_{4\ 31}$ (central midfielder)	0	0	0.14	1.26
$G_{4\ 32}$ (central midfielder)	0	0	0.2	1.5
$G_{4\ 33}$ (central midfielder)	0	0	0.32	1.58
$G_{4\ 34}$ (central midfielder)	0	0	0.75	0.75
$G_{5\ 35}$ (side midfielder)	0	0	0.63	1.17
$G_{5\ 36}$ (side midfielder)	0	0	0.94	0.86
$G_{5\ 37}$ (side midfielder)	0	0	0	1.9
$G_{5\ 38}$ (side midfielder)	0	0	0.12	1.58
$G_{5\ 39}$ (side midfielder)	0	0	1.44	0.16
$G_{5\ 40}$ (side midfielder)	0	0	0	1.5
$G_{5\ 41}$ (side midfielder)	0	0	0.45	1.05
$G_{5\ 42}$ (side midfielder)	0	0	0.29	1.62
$G_{5\ 43}$ (side midfielder)	0	0	0	2
$G_{5\ 44}$ (side midfielder)	0	0	0.13	1.77
$G_{5\ 45}$ (side midfielder)	0	0	0	1.7
$G_{5\ 46}$ (side midfielder)	0	0	0.18	1.32

$G_{6\ 47}$ (forward)	0	0	0.42	0.98
$G_{6\ 48}$ (forward)	0	0	1.05	0.45
$G_{6\ 49}$ (forward)	0	0	0.88	1.12
$G_{6\ 50}$ (forward)	0	0	0.46	1.44
$G_{6\ 51}$ (forward)	0	0	0.85	0.85
$G_{6\ 52}$ (forward)	0	0	0.28	1.72
$G_{6\ 53}$ (forward)	0	0	1.44	0.16
$G_{6\ 54}$ (forward)	0	0	0.3	1.6
$\Pr ediction_{sucess}$ = **2.262**	**0**	**0**	**0.333**	**1.929**

Further on, according to formula (7) of step 7) of the fuzzy methodology described in the previous chapter, on the last line of table 12 we obtain a real solution marked with $\Pr ediction_{sucess}$, which indicates the final result regarding the prediction or forecast of performance within football sports management by fuzzy logic from a value analysis perspective on game tactical compartments of players.

As mentioned also in the previous chapter 3 pertaining to the presentation of fuzzy methodology, the value $\Pr ediction_{success}$ will be a real number from the reference range $[-3,3]$. In this context the sports performance susceptible of realization by the third league football team of the present case study at the end of the football season 2014-2015 respectively F.C. Nuova Mama Mia Becicherecu Mic of Timiş county in Romania, through the prism of multi-criteria fuzzy of value analysis on tactical game compartments of players from its composition, will be mirrored by its place or its position in the final rankings of the championship. In this context the reference range of which I was referring previously respectively $[-3,3]$, will be divided into equal parts equivalent in number with the number fourteen, corresponding to the total of teams composing the football championship which activates the team subjected to the process of prediction of sporting performance. Graphic representation of the fact mentioned in this paragraph can be seen in fig. 3 from below.

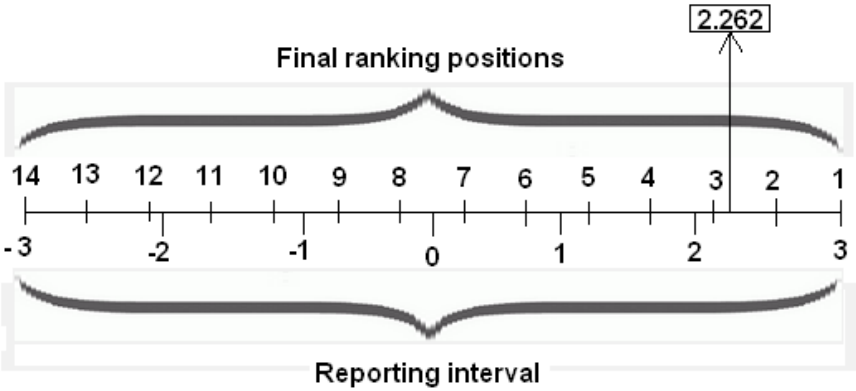

Figure 3: Graphic representation of the reference range, of positions in the final rankings and of the potential or forecasted place to be occupied at the end of the 2014-2015 seasons by the football team F.C. Nuova Mama Mia Becicherecu Mic

In this context it can be easily noted that the value $\Pr ediction_{sucess}$ = **2.262** which indicates the final result regarding the prediction or forecast of performance within football sports management by fuzzy logic from the value analysis perspective on game tactical compartments of players merged with the reference range and with the positions in the final rankings indicate the fact that the potential or forecast place to be occupied at the end of the 2014-2015 season by the football team F.C. Nuova Mama Mia Becicherecu Mic is somewhere between the second and third position and no lower than the stage of the final ranking. It must be mentioned that this result is a very realistic one, this aspect being supported also from the view that at the moment of editing this research article for the purpose of publishing, the football team subjected to the study was placed at half the competition season on the second position in the ranking with a total of 28 points according to the print-screed below pertaining to a specialized sports website, mentioning that one football team out of fourteen has been excluded from the championship during the ongoing championship round because of financial reasons.

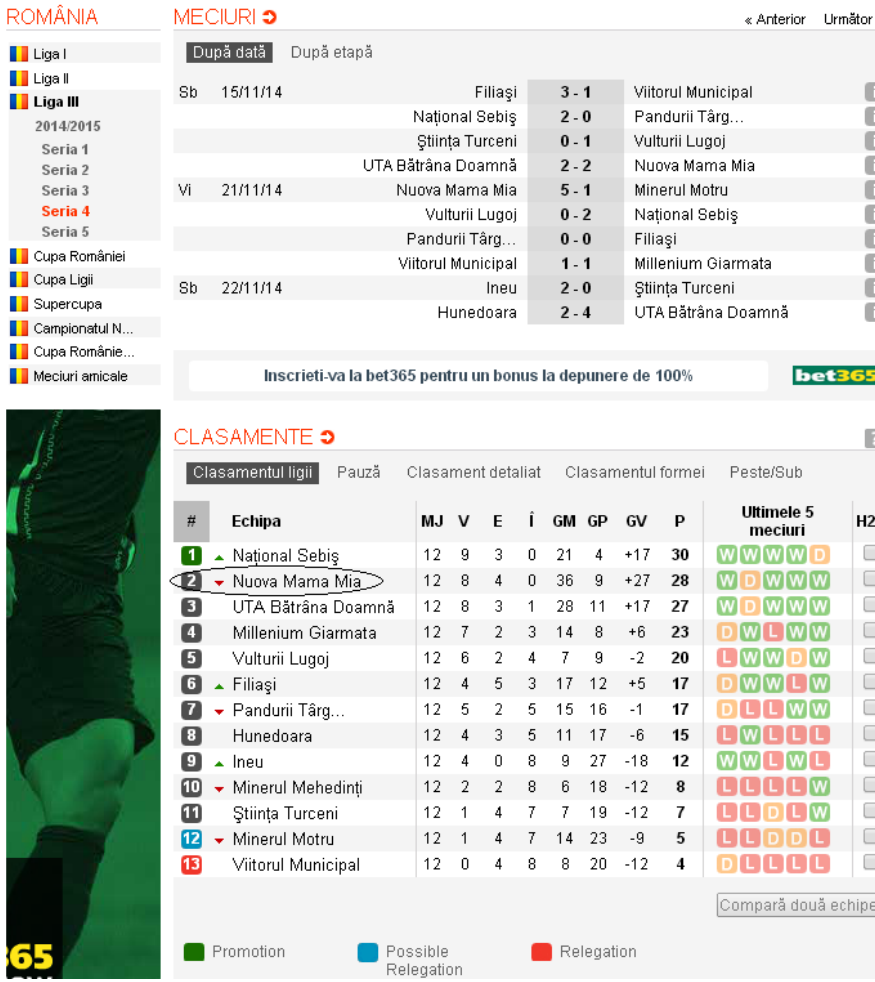

Figure 4: The print-screen pertaining to visualizing the football rankings at half of the competition season 2014-2015
Source: http://ro.soccerway.com/national/romania/liga-iii/20142015/seria-4/r28129/, accessed 10.03.2015.

Given these aspects previously presented, all premises exist that at the end of the 2014-2015 season championship the football team F.C. Nuova Mama Mia Bechicerecu Mic to be situated on one of the first three positions of the final rankings stage, this all the more because from what can be seen

it has not suffered any seasonal defeat until the midst of the season, having o defeats as well as the best attack and the third defense of the championship by view of the goal average.

Conclusions

Regarding the conclusions which unfold from this research material, we can undoubtedly affirm that the mathematical instrument suggested for the purpose of exercising the forecasting process of performance within football sports management by fuzzy logic from the value analysis perspective on game tactical compartments of players has proven its complete efficiency within the case study from the fourth chapter, this moreover because there has been a testing or verification leverage of the objectivity of the final result obtained, namely second place held at the final of half the football team championship subjected to research, position approximately equivalent with the potential or forecast one to be held at the end of the competition season 2014-2015, this otherwise being an important aspect which strengthens the viability of the instrument based on fuzzy logic in this research article.

Moreover it has to be specified that the approach, conceiving, projection and implementation of the fuzzy methodology proposed in this research study can have a grand auspicious role in different situations or circumstances which ply to such a model and which requires such undergoing, giving a real, flexible and performance support to managers in the perspective of supplying very realistic and fast results within certain forecasting processes of organizational performance of any kind, regarding sports organizations in particular as well as other economical or organizations of another profile.

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