THE ORGANIZING SCHEME OF THE MUNDIAL

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Abstract

This study aims to highlight the negative aspects of the organizational scheme of the World Cup in Football, of the European Championship and other similar activities. The first Mundial in Uruguay, in 1930, took place with the participation of 13 countries. After that, up to the 12th World Cup, the initial number of participants was 16 and in 1982, in Spain, the number of teams increased in 24, number that was maintained until the 15th Mundial. From 1998 onwards, FIFA decided to increase the number of teams from 24 to 32. We have to say that **the quantitative increase** of the number of teams of the activity, would undoubtedly, bring out **qualitative problems,** that reflect unpleasant phenomena during the closing phase of this major activity.

Keywords: football, championship, scheme, countries

Introduction

If we take a look at the history of the development of the World Cup, we notice that the first stage starts with groups of 4 teams each. From the analysis made in my full study, it turns out that the organizational schemes used so far, bring a series of negative phenomena, as follows:

1. When the 6 matches into a group of 4-teams are over, according to the existing scheme, places 3 and 4 of every group are relegated. It means that after the first stage, ***50%*** *of the teams taking part, are out. The relegation in such percentage, for the teams that after 2 matches have 0 or even 1 points, have no more CHANCES to be qualified for further on. In such conditions, those teams are not any more interested, "to fight" in the third match. It's affected negatively, this way, the most basic characteristic that must be retained during the Mundial, i.e., THE COMPETITIVE EFFORT.*

2.The participating teams in the Mundial have qualitative changes, that are fixed in the end, with the definitive row, from place 1 up to 32. ***The greater the number of the relegated teams*** *from the activity,* ***the closer the quality*** *of remaining ones for the next stages. Therefore, we need more proves, i.e., matches, to tell out any team,* ***a very little better*** *from the next one. This indicates another negative point of the existing scheme: 48 matches, or 75% of all the matches of Mundial, are spent in the first stage to identify the 16 weakest teams out of 32, with an average value 3 matches for every eliminated team. After that we have 15 matches, i.e., 25% of all the proves only, to eliminate 15 teams. One match for every eliminated team, in* ***conditions that the identification to find out the Champion, becomes more difficult****.*

I am naming the ratio of the number of matches to the number of eliminated teams by them, ***"identifying coefficient".*** *A well-studied scheme, must bring the values of this coefficient, less in the beginning and bigger at the end of Mundial. This indicator for the up to now schemes*

3. After the first round is over, we are compelled to use the knock-out system, up to the end of the activity, that in my opinion, is the most negative part of the scheme. The psychological load in such a system is very large and if necessary the extra-times, the physical load increases, as well.

4. Another shortcoming of the existing scheme is ***the possibility for compromises and different predictions****, either from teams that after 2 matches are qualified, or by teams that after 2 matches in their group have no chances to be qualified. (Just remember the "Disgrace of Gijon", in the World Cup of Spain, in 1982 and so on). This possibility exists because of the* ***"pre-established character"*** *of the organizing scheme.*

To avoid these negative phenomena, we need a new scheme, with other features.

1. The number of relegated teams, stage after stage, has to be done in a way that doesn't minimize the competitive efforts in everyone match of the activity.

2. ***The pre-established schemes,*** *must give way to the* ***"moving ones",*** *avoiding this way, the possibility for different predictions and compromises.*

3. The formulation of the rules to form the groups for the next stage, by ***"joining the antipodes"****, in order that the only prediction for every team, to be* ***"the interest***

***to get the best possible results"**, in the previous stage.*

Let us analyze what is expected to happen during the rounds of Mundial.

Subject

I am judging first, what is expected to happen in a group of 4 teams each. Every team has to play 3 matches and the full space of events, in such a case, is represented in the table below:

	EVENT	Symbol	Points
1.	3 wins	3W	9 points
2.	2 wins 1draw	2W1D	7 points
3.	2 wins 1 loss	2W1L	6 points
4.	1 win 2 draw	1W2D	5 points
5.	1win,1draw,1loss	1W1D1L	4 points
6.	1win 2 losses	1W2L	3 points
7.	3draws	3D	3 points
8.	2 draws 1 loss	2D1L	2 points
9.	1draw 2 losses	1D2L	1 point
10.	3 losses	3L	0 points.

9
1
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*The probability that a match will bring **win, draw** or **loss** is the same and equal to,*

$$p_w = p_e = p_l = 1/3$$

According to the combining account of the probability, every event from number 1 up to 10, possesses its probability, that is counted by the formula,

$$P_{(i)} = \frac{n!}{n_1!n_2!n_3!} \cdot p^n$$

F ex., the probability of the event 3W, would be:

$$P_{(1)} = \frac{3!}{3!\cdot 0!\cdot 0!} \cdot \left(\frac{1}{3}\right)^3 = \frac{1}{27} = 3.7\%$$

The event 2W1D, that gives 7 points in 3 matches, has the probability:

$$P_{(2)} = \frac{3!}{2!\cdot 1!\cdot 0!} \cdot \left(\frac{1}{3}\right)^3 = \frac{3}{27} = \frac{1}{9} = 11.1\%$$

In the same way we can count the probabilities of the whole space of events, from 1 to 10, and expressing them in percentage, we should profit the expected number of teams, with points from the most possible, 9, up to 0 points. These data are systematized in the table below:

Tab. Ne. 1

Points	Probability	Progressive	
9	3.7%	3.7%	
7	11.1%	14.8%	
6	11.1%	25.9%	
5	11.1%	37.0%	**50%**
4	22.2%	59.2%	
3	**14.8%**	**74.0%**	
2	11.1%	85.1%	
1	11.1%	96.2%	
0	3.8%	100%	

The numbers in the table Ne. 1, convince us that 60% of the teams are expected to end the first stage with 9, 7, 6, 5 and 4 points. . According to the existing scheme, when the first stage is over, 50% of the teams are relegated. The red line in the table, SHOWS that nearly HALF of the teams with 4 points, are qualified for the second stage, while

the other half is compelled to leave the activity.

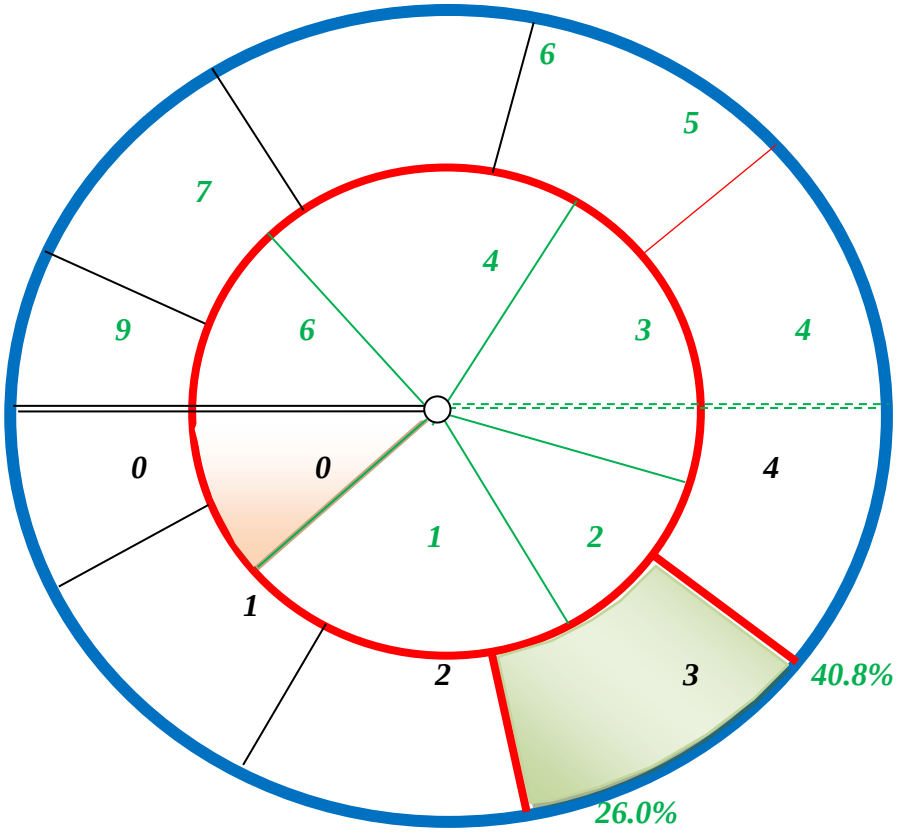
By the same way, we can count the expected points of the teams, after 2 matches, i.e. 1 match before the first stage is over, (for a 4-team group, always).

Table Ne. 2.

Event	2W	1W1D	1W1L	2D	1D1L	2L
Points	6	4	3	2	1	0
Exp. P_i	1/9	2/9	2/9	1/9	2/9	1/9
Prog.%	11.1	33.3	55.5	66.6	88.8	100

The whole space of events would be as it follows, in the table Ne. 2, below:

Representing the data of tables Ne. 1 and 2, in a double circular diagram, we can "judge" the relationships, created in the last of the first stage of Mundial.



In the inner circular diagram, are represented the expected points of teams after 2 matches for every team. In the outer one, you can see the expected percentages of teams with points from the maximal 9, up to the ones with 0 points. In the to-day organizing scheme, the line of "demarcation sends out" of the activity, 16 teams, i.e., 50% of them. IT MEANS that… 11.1% of teams with 0 points in 2 matches,

mathematically, ***have not any chances to be qualified.*** *After that,* ***from 55.5%*** *of the teams that after 2 matches have taken 1,2,3 points,* ***16.7% of them only****, will be qualified. If we want to avoid such a phenomenon, we must decide that the demarcation line between the* ***qualified*** *from* ***unqualified*** *teams, to be put in such a "position" that even the last match into the group, TO POSSESS* ***the possibility to qualify*** *a team that has no points from the previous matches.*

ANALYSE

Generally, for a group of n_i *teams, we can eliminate a percentage, that remains always between* $\frac{1}{n_i} < k_e < \frac{1}{n_i - 1}$ *of all the teams of the stage. I am naming the value* k_e*, "eliminating coefficient". If we want to be more exact, the minimal and maximal values of* k_e*, can be counted in the relation:* $\sum_{i=0}^{2} P_{(i)} < k_e < \sum_{i=0}^{3} P_{(i)}$

According to the relation above, with the data of table Ne. 1, when $n_i = 4$*, the value of this coefficient, must be accepted,* $26\% < k_e < 40.8\%$ *; for* $n_i = 3$*, from table Ne. 2, we find out,* $44.4\% < k_e < 66.6\%$.

Meanwhile, on the other hand, 11.1% of teams with 6 points and the greatest part of the teams with 4 points, are qualified for the next round. These teams have the ***"luxury" to select*** *what "is better" for them: to win the third match or to lose it? To try the 1st place in their group or is it more profitable to get the 2nd one. Of course after that,* ***the further on development will not be the one that should have to.***

To avoid such a phenomenon, the continuation from one round to another, must be done by accepting a new idea, that I have named the "MOVING SCHEME". And of coarse, first of all, we have to make it clear, what ***A MOVING SCHEME*** *is.*

Let's judge the following: In the last of the 1st stage, the teams are ranked from the place 1 up to 4, into their groups. Instead of that, in the last of the 1st stage, we rank all the teams in a row from place 1 up to the last one, according to their results into their groups, with the way we rank the teams from 17 up to 32, after the first round is over. I am fixing what would be this row like, with the results of the teams after the first round in the Mundial of 2010:

Rank	Countries	GF	GA	GD	PTS
. 1	Argentina	7	1	+6	9
. 2	Netherlands	5	1	+4	9
. 3	Uruguay	4	0	+4	7
. 4	Brazil	5	2	+3	7
. 5	Germany	5	1	+4	6
. 6	Spain	4	2	+2	6
. 7	Japan	4	2	+2	6
. 8	Chile	3	2	+1	6
. 9	Portugal	7	0	+7	5
.10	Paraguay	3	1	+2	5
.11	U.S.A.	4	3	+1	5
.12	England	2	1	+1	5
.13	Ivory Coast	4	3	+1	4
14	Mexico	3	2	+1	4
15	Slovenia	3	3	0	4
16	Ghana	2	2	0	4

Rank	Countries	GF	GA	GD	PTS
17	Switzerland	1	1	0	4
18	S. Korea	5	6	-1	4
19	Slovakia	4	5	-1	4
20	S Africa	3	5	-2	4
21	Australia	3	6	-3	4

.	22	N. Zealand	2	2	0	3	.	28	Algeria
.	23	Serbia	2	3	-1	3	.	29	France
.	24	Denmark	3	6	-3	3	.	30	Honduras
.	25	Greece	2	5	-3	3	.	31	Cameron and,
.	26	Italy					.	32	N. Korea.
.	27	Nigeria							

This rule allows no predictions and therefore, no possibilities for compromises and unmerited profits.

Finally, let's see what's the idea of "joining the antipodes", that is the rule to continue in the second round.
In the existing scheme, the second round foresees the forming of 8 couples, according to certain rules already. I am going to form this couples with the qualified teams of the Mundial, 2010, from 1 up to 16, applying the idea of "joined antipodes".
The couples should have been:

	Couple	Countries
1	*1-16*	*Argentina-Ghana*
2	*2-15*	*Netherlands-Slovenia*
3	***3-14***	***Uruguay-Mexico***
4	***4-13***	***Brazil-Ivory Coast***
5	*5-12*	*Germany-England*
6	*6-11*	*Spain-U.S.A.*
7	*7-10*	*Japan-Paraguay*
8	*8-9*	*Chile-Portugal*

Such a rule creates conditions quite different from those of the existing scheme.

Finally, according to all that have been said above and respecting the definitions reached, we can perceive an organizational scheme that avoids the shortcomings of the existing scheme.

Proposal

After those, we can formulate schemes for the Mundial, knowing quite well from the very beginning, the conditions that will be created and what criterions will be respected during it. At the same time, we have first of all, to respect the general conditions below:

a) The length in time, nearly 30-32 ...days.

b) Matches for finalist 7, 8 matches.

c) The starting number of teams for the Mundial 30,33,36, 39…..

d) The total number of matches 59, 65, 68, 74.
e) The total number of teams in the groups of different stages, 3, 4 and maybe ***once only,*** *for the final match, 2.*

I am describing below, based on the definitions of this study, for the initial number of the participators equal to 36.

The first round begins with 11 groups of 3 teams each. After the 33 matches of all the groups altogether, we rank the teams from place 1 up to 33. Accepting $k_e = 54.5\%$, *18 teams, from 16 up to 33 will be eliminated. The identifying coefficient of this round will be:* ***33 : 18 = 1.8*** *matches for every eliminated team. The teams from place 1 up to 15, will go on, in the second round.*

5 groups of 3 teams are created, following the rule below:

Group	*A*	*B*	*C*	*D*	*E*
Pl	*1*	*2*	*3*	*4*	*5*
ac	*6*	*7*	*8*	*9*	*10*
e	*15*	*14*	*13*	*12*	*11*

When the 15 matches of this tour are over, we recreate the row from 1 to 15 with the results of the second round. For this round, $k_e = 46.7\%$ *takes out of the activity 7 teams, from place 9 to 15, with the identifying coefficient* ***15 : 7 = 2.1*** *matches for team.*

8 qualified teams of places from 1 to 8, will form two 4-team groups, for the semi-final round, as follows:

	Places			
Group I	*1*	*3*	*6*	*8*
Group II	*2*	*4*	*5*	*7*

There are 12 matches in the semi-final round, 3 for every team. When this tour is over, the teams are ranked into their group, from place 1 to the place 4.

2 last places of every group are eliminated. Therefore, the identifying coefficient would be: 12 : 4 = 3 matches for eliminated team.

In the final round the second places of groups I and II, will play to win the third place, while the first ones, will play to share the ***title*** *and the* ***second*** *place.*

The proposed scheme in my study, possesses the positive characteristics, as below:

First, the scheme favors the best teams toward the title, without refusing the others, the possibilities to be ranked as higher as possible.

Second, respecting the eliminating coefficients, by one hand and the idea of joining the antipodes, on the other one, ***every team*** *is interested to "fight" even in its* ***last match:*** *the weaker teams, as the possibility of qualifying* ***does exist,*** *the stronger ones because, the* ***better*** *the results of the previous round, the* ***easie****r the matches in the next one.*

Third, no predictions for the next round can be done. The number of different possibilities while ranking the teams from 1 up to 33, is counted $33! = 8.7 \times e^{35}$. *Consequently, it becomes impossible to predict "the particular" that leads to undeserved benefits. On the other hand, the scheme enables ONLY a general prediction for every one of the teams:* ***to achieve the best possible result in every match. Therefore, no compromises, of coarse !***

Forth, we have seen, not infrequently, in the World Cups, in early stages, matches between teams that should probably have to meet maybe in the final. (Remember f. ex., in the quarter-final round of 1986, in Mexico, the match Brazil-France).

Fifth, the scheme proposed above, realizes the effective use of the matches, in different rounds of the World Cup. The identifying coefficients increase from 1.8 matches/team in the first round, to 2.1 in the second and to 3.0 matches/team in the semi-final tour. It means that the elimination of teams is done, step by step, with the required number of proofs: the more eliminated teams, the more the needed proofs, to identify the less good teams, from the very little better ones.

Sixth, for the 2 last matches of the World Cup, the knock-out system is used. Therefore, the possibility of having extra time exists for these two matches, only. The other 60

matches have no need for extra-times. Consequently, the psychological load of the teams, as well as the physical one, are much more normal than in the existing scheme. This is very important because the proposed scheme increases the number of matches for the finalists, from ***7*** *to* ***8.***

At last, there is a "negative" phenomenon that may occur if we use the proposed scheme. I call it ***"repeated pairing".*** *There is a possibility that two teams of a group in the previous round, to be in the same group that are formed for the next stage, as well! It's a bit annoying to watch two teams to replay a second game, right after the first. F. ex., the hypothetical couples of 2010 World Cup,*

3 ***3-14*** ***Uruguay-Mexico***
4 ***4-13*** ***Brazil-Ivory Coast,***
bring together teams that were in the same groups during the first round.

Firstly, this phenomenon can be eliminated by shifting the rank of the two neighboring teams.

Secondly, in the full study I calculated that this phenomenon ***is expected to occur ONCE in TWO to THREE championships.***

Conclusions

I believe it is time to substitute the existing organizational scheme with a better and more studied one, because of its shortcomings. I also want to believe that the proposals made in the study above, provide us with a scheme that deserves the attention of the respective organizations, responsible for the development of World Cups in the future.

Finally, the scheme proposed above, pertains to the initial participants' number, N=33. The study provides solutions for other values of the initial number N, starting from $N \in \{24,27,30\}$ *,values that best suit the European Championship and for* $N \in \{33,36,39,42,45,48,51\}$ *, for the World Cup. These schemes are summarized in the table below:*

Nr	Sk	Nd.gj	n_1xg_1	N_1	K_1%	E_1	Q_1	$n_2 \cdot g_2$	N_2	K_2%	E_2	Q_2	$n_3 \cdot g_3$	N_3	K_3%	E_3	Q_3	$n_4 \cdot g_4$	N_4	K_4%	E_4	Q_4
1	27	47	9x3	27	55.5	15	12	4x3	12	50.0	6	6	2x3	6	33.3	2	2+2	1x2+1x2	2	25.0	1	1+1+1
2	30	59	10x3	30	50.0	15	15	5x3	15	46.7	7	8	2x4	12	50.0	4	2+2	1x2+1x2	2	25.0	1	1+1+1
3	30	53	10x3	30	50.0	15	15	5x3	15	60.0	9	6	2x3	6	33.3	2	2+2	1x2+1x2	2	25.0	1	1+1+1
4	30	50	10x3	30	60.0	18	12	4x3	12	50.0	6	6	2x3	6	33.3	2	2+2	1x2+1x2	2	25.0	1	1+1+1
5	33	65	11x3	33	45.4	15	18	6x3	18	55.5	10	8	2x4	12	50.0	4	2+2	1x2+1x2	2	25.0	1	1+1+1
6	33	62	11x3	33	54.5	18	15	5x3	15	46.7	7	8	2x4	12	50.0	4	2+2	1x2+1x2	2	25.0	1	1+1+1
7	33	56	11x3	33	54.5	18	15	5x3	15	60.0	9	6	2x3	6	33.3	2	2+2	1x2+1x2	2	25.0	1	1+1+1
8	33	59	11x3	33	63.6	21	12	4x3	12	33.3	4	8	2x4	12	50.0	4	2+2	1x2+1+2	2	25.0	1	1+1+1
9	36	68	12x3	36	50.0	18	18	6x3	18	55.5	10	8	2x4	12	50.0	4	2+2	1x2+1x2	2	25.0	1	1+1+1
10	36	59	12x3	36	58.3	21	15	5x3	15	60.0	9	6	2x3	6	33.3	2	2+2	1x2+1x2	2	25.0	1	1+1+1
11	36	65	12x3	36	58.3	21	15	5x3	15	46.7	7	8	2x4	12	50.0	4	2+2	1x2+1x2	2	25.0	1	1+1+1
12	51	82	17x3	51	58.8	30	21	7x3	21	46.7	7	8	2x4	12	50.0	4	2+2	1x2+1x2	2	25.0	1	1+1+1
A	24	53	8x3	24	37.5	9	15	5x3	15	46.7	7	8	2x4	12	50.0	4	2+2	1x2+1x2	2	25.0	1	1+1+1
B	24	44	8x3	24	50.0	12	12	4x3	12	50.0	6	6	2x3	6	33.3	2	2+2	1x2+1x2	2	25.0	1	1+1+1

N_1:N	N_2:N	N_3:N	/E_1	/E_2	/E_3
57.4%	25.5%	12.8%	3.8%	4.3%	6.4%
50.8%	25.4%	20.3%	3.4%	3.6%	5.1%
56.6%	28.3%	11.3%	3.8%	3.1%	5.7%
60.0%	24.0%	12.0%	3.3%	4.0%	6.0%
50.8%	27.7%	18.5%	3.0%	2.9%	4.8%
53.2%	24.2%	19.4%	3.0%	3.5%	4.8%
58.9%	26.8%	10.7%	3.3%	3.0%	5.4%
55.9%	20.3%	20.3%	2.7%	5.1%	5.1%
52.9%	26.5%	17.6%	2.9%	2.7%	4.4%
61.0%	25.4%	10.2%	2.9%	2.9%	5.1%
55.4%	23.1%	18.5%	2.6%	2.6%	4.6%
58.0%	23.9%	13.6%	1.7%	3.0%	3.0%
45.3%	28.3%	22.6%	5.0%	4.0%	5.7%
54.5%	27.3%	13.6%	4.5%	4.5%	6.8%

As for the European Championship we can say that this activity just "copies" the Mundial. In 2016 OUEFA decided that the initial number for the European, will be 24. According to the definitions of this study, if the scheme for the activity of 24 teams, will be one of the schemes used in any of the previous Mundial, you have to be sure that the same , "symptoms" being seen in these Mundial, will appear in the European, too! I believe the tendencies to increase the number of teams taking part, are really good. The only problem is the fact that,

the organizing scheme, must be chosen very carefully.

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