Bulletin UASVM, Horticulture 65(2)/2008
pISSN 1843-5254; eISSN 1843-5394

PERFORMANCE CRITERIA IN THE UNIVERSITY MANAGEMENT

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Keywords: performance criterias, Electre, hierarchy, indicators, university management

Abstract: This article is dealing with the idea of performance criteria regarding some statistical indicators. This research shows quantifiable criteria of appreciation of management applied at Technical University of Cluj-Napoca. Electra method of creating hierarchies of decisional variation was made in order to realize the faculty rank from the university by analyzing the data for the last 6 years. Developing the applications for this purpose has facilitated the task manager to achieve rapid results.

INTRODUCTION

"National Conference Statement of Higher Education" from November, 2003 and "Romanian Higher Education Strategy during the period 2002-2010" [5] were the point of reference in the management of university – management oriented through competitiveness and performance.

"The purpose of the university management is to promote the strategy of working and developing the university and to improve it with the proposed objectives" [1], in a period of time and in a continuously changing external environment, to change the dynamics of these goals and actions, depending on the evolution of the labour market and to evaluate the result.

The strategic plan allows for the evaluation of the main directions of institutional development and particularly its chances of success. One of the strategic goals of planning is to provide a basis for monitoring performance.

Fulfillment of the objectives assumed under the strategic plan can be done only through a permanent checking of achieving goals stages, drawing up permanent evaluations of the obtained indicators. This means establishing some parameters and quantifiable, measurable indicators which would permanently provide the mirror of the objectives achieving level.

In this regard, it is absolutely essential to have a permanent evaluation of academic performances and to provide a mechanism through which to obtain a continuous improvement. A remarkable management not only evaluates its own performance, but must have up to date databases and an efficient information system, to demonstrate the obtained results and to allow total transparency of managerial acts.

Performance measurement of managerial process involves complex activities that include the following stages: collecting the primary data, data encoding by their translation into interpretable datasets, sorting data, data analysis and interpretation, presentation of the conclusion.

Barnetson and Cutright [4] define "*performance indicators as being the conceptual technologies which establish "WHAT" is considered important in the evaluation and "HOW" those elements are regarded."*

Burton Clark [6] affirms: "…there is not a Western model. Wanting to copy such a

model is an evidence of naivety and ignorance. Dynamic universities have invented their own models. This is probably the only way that remained for us to do".

This present work aims to establish internal levels of performance, drawing up a study based on statistic data and organizing the faculties within the Technical University of Cluj-Napoca in hierarchy according to their performance.

MATERIALS AND METHODS

Analyzing performance indicators proposed by various national (CNFIS [8], ARACIS [9] and international organizations (Shanghai Classification [7]; US News Classification [2] etc.) but also the studies that have been drawn up at the Technical University's high level of management, a questionnaire has been created containing 10 appreciation criteria of university management activities. At the proposal of the Technical University of Cluj-Napoca's leading members, the questionnaire was distributed among the academic staff members of the TUCN Senate.

The proposed criteria for fulfilling this analysis were:

1. number of students (cycle I, II, III).
2. the share of professors in the total posts filled;
3. the share of professors and lecturers in the total posts filled;
4. correlation between the number of students and number of didactics posts;
5. correlation between the index regarding the number of students and number of didactic posts;
6. correlation between number of students and working hours;
7. correlation between the index regarding the number of students and working hours;
8. the amount of hours exceeding the job positions from the working hours;
9. the level of filling the available didactic posts;
10. research activity perceived through the number of points.

Each of these criteria was the object of some analysis, after which we moved to organizing the hierarchy of the Technical University of Cluj-Napoca's faculties using "Electra" methods [3]. This is a method frequently used for optimizing multi-criteria decision.

Each criteria is given a share (k_i), based on the results of the questionnaire. Statistics data afferent for the used criteria in the study are registered in a matrix (with a_{ij} elements) that will contain a variation on the horizontal (in the studies case are Faculties F_i) and the values afferent to the criteria (C_j) on the vertical side.

Starting from this matrix of synthetic indicators and establishing the optimum alternatives, there will be obtained by interpolation a matrix with values (m_{ij}) between [0-1].

For the criteria it is considered the optimum variation the maximum one, we note with 0 the minimum position and with 1 the maximum position and the other values are calculated by interpolation with the formula:

$$m_{ij} = \frac{a_{ij} - a_{jmin}}{a_{jmax} - a_{jmin}} \quad (1)$$

where: a_{jmax} = the maximum value of criterion j; a_{jmin} = the minimum value for the criteria; a_{ij}= afferent values for i, j position, from synthetic matrix of indicators.

In the same way, for the criteria it is considered that the optimum variant is the minimum one, it is noted with 1 minimum position and with 0 maximum position, the other values being calculated by interpoling with formula:

$$m_{ij} = \frac{a_{jmax} - a_{ij}}{a_{jmax} - a_{jmin}} \quad (2)$$

where: a_{jmax} = the maximum value of criterion j; a_{jmin} = minimum value of a criteria; a_{ij}= the values afferent for I,j position, from synthetics matrix of indicators.

On the basis of the obtained matrix, the concordance and discordance indicators between pairs of two variation (F_g, F_h) are calculated. The concordance indicator takes subunit values and it will give information about the level of exceeding variation F_g toward a variation F_h. The discordance indicator shows when a variation F_h exceeds another variation Fg.

The concordance indicator between two variant F_g and F_h is defined:

$$C(F_g, F_h) = \sum_j k_j / (k_1 + k_2 + ... + k_{10}) \text{ pentru } a_{gj} \geq a_{hj} \quad (3)$$

where: k = means the percent of every criteria; C = concordance indicator between two variant F_g and F_h.

In the analyzed case, the k coefficient amount is 1, and the formula is:

$$C(F_g, F_h) = \sum_j k_j \quad (4)$$

In order to calculate the discordance indicators, the following formula is applied (5):

$$D(F_g, F_h) = \begin{cases} 0, & \text{if } a_{gj} > a_{hj} \\ \frac{1}{d} \max \left| a_{gj} - a_{hj} \right| & \text{for j, where } a_{gj} \leq a_{hj} \end{cases} \quad (5)$$

where: D = discordance indicators between two variants F_g and F_h, and d = maximum deviation between the values of all units of the matrix, in this case d=1, and the formula become:

$$D(F_g, F_h) = \begin{cases} 0, & \text{if } a_{gj} > a_{hj} \\ \max \left| a_{gj} - a_{hj} \right| & \text{for j, where } a_{gj} \leq a_{hj} \end{cases} \quad (6)$$

The pairs of values representing concordance and discordance indicators between two variants underlie the calculation of the difference between the two indicators, which will lead under classing relation defined as:

Fi overtaken Fj if: C_{F1F2}-$d_{F1F2} \geq C_{F2F1}$-d_{F2F1} (7)

where with C_{FIF2} is concordance coefficient and d_{FIF2} is discordance coefficient.

The result is written in a matrix where F_{ij} is 1 if F_i overtaken F_j and otherwise is 0.

In a graph, the overtaken relation represents an arch oriented from F_i towards F_j. The optimum variant overtakes all other variants.

RESULTS AND DISCUSSIONS

For establishing the score, 10 criteria were proposed for analysis, marked from 1 to 10 and after gathering in the questionnaires and the percentage for every criteria, the results presented in table 1 were obtained:

Table 1

The distribution of scores obtained on criteria

Criteria	C4	C10	C1	C5	C9	C2	C3	C7	C6	C8	TOTAL
Score	173	164	152	148	138	136	135	121	118	81	1366
%	12.66	12.01	11.13	10.83	10.10	9.96	9.88	8.86	8.64	5.93	100.00

One can observe a fairly homogeneous distribution. The highest score was given to criteria 4 (the correlation between number of students and number of didactic posts).

Each criteria was assessed on each faculty, comparatively for the last 5 academic years (2003/2004 – 2007/2008). Data were collected and processed, leading to a hierarchy of faculties using the “Electra” method.

For example, we analyze the 2nd criteria (professors' percent in the totally occupied posts). This underlines, on one hand, the university's tradition, the stability of professors, and also a high level of personal training of the staff, which represents the premise for a quality of education. By comparing the number of university professors to all occupied posts, on faculties, the data presented in Figure 2 was obtained.

It can be seen that there is an unequal allocation per faculty, the faculty with the tradition, where the percent of professors is very high (eg. In the faculty 6 and 7 are over 40%), but also there are faculties (eg.1) with only 10%. On the other hand, this study emphasizes the fact that at most faculties there is a shortage of young staff, respectively the jobs of Ph.D. students, assistants, chief of works, reflected in the didactic personal salary costs.

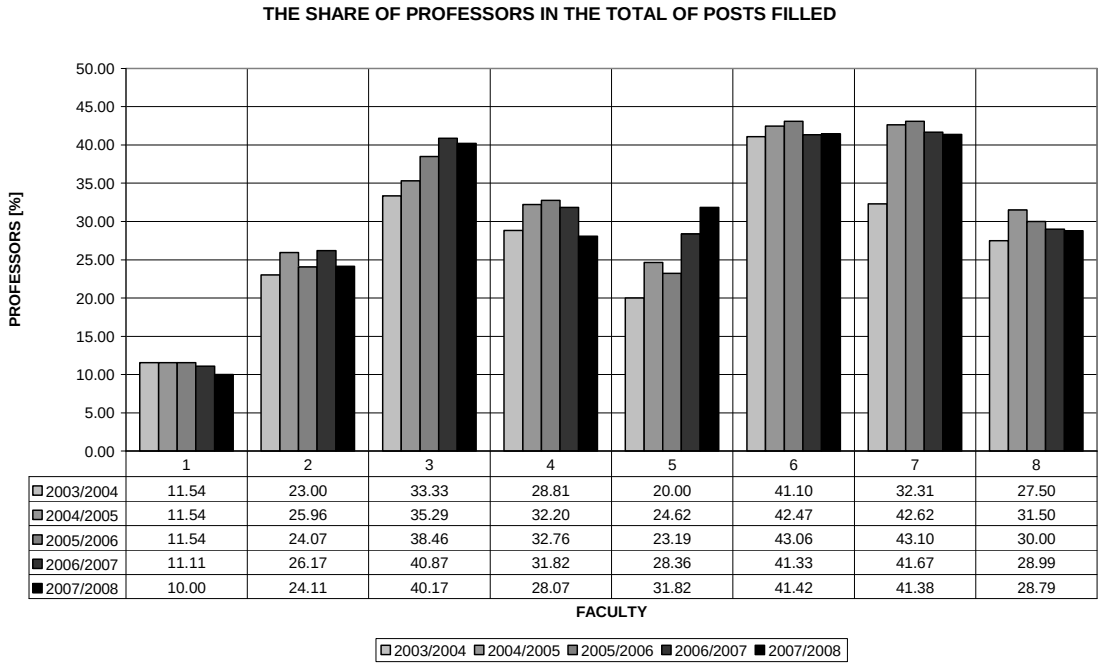

Figure 2

Similarly every criteria was treated and a series of conclusions regarding the evolution of these indicators in the Technical University of Cluj-Napoca were established.

The results of the processing using „ELECTRA" method for the 10 criteria afferent in the academic year 2007/2008 are presented in Table 2.

Table2

Statistics indicators

k	0,111	0,1	0,1	0,127	0,108	0,086	0,088	0,059	0,101	0,12
	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10
F1	641.00	10.0	36.67	11.05	1.04	1.07	0.98	11.83	51.72	4865.32
F2	1689.00	24.11	41.07	7.54	0.90	1.54	1.12	11.64	50.00	28732.44
F3	1796.00	40.17	59.82	9.21	0.87	1.24	1.15	11.45	60.00	28943.71
F4	2971.00	28.07	47.37	12.86	0.89	0.95	1.17	12.26	49.35	12569.35
F5	1202.00	31.82	51.52	9.32	0.97	1.34	1.05	12.52	51.16	22392.04
F6	648.00	41.42	63.16	6.29	0.81	1.68	1.31	10.57	73.79	17083.21
F7	971.00	41.38	60.34	8.99	0.90	1.27	1.10	11.41	53.70	21048.14
F8	610.00	28.79	50.00	6.78	0.86	1.60	1.16	10.88	73.33	26359.14

K = coefficiences of importance of each criterion, taken from Table 1
C1-C10 = criterias 1-10; F1-F8 = faculties 1-8.

Applying this method, and considering that, out of criteria 6 and 7 (which are optimum for the minimum value), the other criteria have the entire optimum variant on maximum, we get the results presented in Table 3.

For example, for criteria 1, the minimum value is 610, afferent for line F8 and in Table 3 it is noted with 0, and maximum value is 2971, value afferent for line F4, and we note it with 1. Other values are calculated with the interpolation formula (1).

For criteria C6, where it is considered that optimum is recorded for minimum values, we note with 1 the value afferent for line F4 and with 0 the value afferent for line F6. Other values are calculated with interpolation formula (2).

Table 3

Criteria analysis results

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10
F1	0.013	0.000	0.000	0.725	1.000	0.836	1.000	0.646	0.097	0.000
F2	0.457	0.449	0.166	0.190	0.391	0.192	0.576	0.549	0.027	0.991
F3	0.502	0.960	0.874	0.444	0.261	0.603	0.485	0.451	0.436	1.000
F4	1.000	0.575	0.404	1.000	0.348	1.000	0.424	0.867	0.000	0.320
F5	0.251	0.694	0.561	0.461	0.696	0.466	0.788	1.000	0.074	0.728
F6	0.016	1.000	1.000	0.000	0.000	0.000	0.000	0.000	1.000	0.507
F7	0.153	0.999	0.894	0.411	0.391	0.562	0.636	0.431	0.178	0.672
F8	0.000	0.598	0.503	0.075	0.217	0.110	0.455	0.159	0.981	0.893

C1-C10 = criterias 1-10; F1-F8 = faculties 1-8.

Starting from the data presented in the Table 3 we calculate concordance and discordance coefficient. For example, comparing line F1 with the line F2 from Table 3, we obtained: $C(F1,F2) = C4+C5+C6+C7+C8+C9=$

$= 0,127+0,108+0,086+0,088+0,059+0,101 =0,569$

because: $a_{1,4} > a_{2,}$; $a_{1,5} > a_{2,5}$; $a_{1,6} > a_{2,6}$; $a_{1,7} > a_{2,7}$; $a_{1,8} > a_{2,8}$; $a_{1,9} > a_{2,9}$

Concordance indicators show the superiority of one variant compared to another (in this case presenting the superiority of one faculty compared with another), making differences of variations using the coefficients.To calculate diccordance coefficients, comparing line F1 with line F2, from the Table 3, we obtain: $d(F1,F2) = \max\{|0,013-0,457|, |0-0,449|, |0-0,166|, |0-0,991|\} = 0,991$

Table 4

Concordance and discordance indicators

	F1	F2	F3	F4	F5	F6	F7	F8
F1		0.569 0.991	0.468 1.000	0.297 0.987	0.510 0.728	0.468 1.000	0.468 0.999	0.579 0.893
F2	0.431 0.644		0.255 0.708	0.417 0.810	0.231 0.451	0.699 0.973	0.398 0.728	0.699 0.954
F3	0.532 0.739	0.745 0.130		0.509 0.556	0.618 0.549	0.699 0.564	0.604 0.151	0.899 0.545
F4	0.703 0.652	0.583 0.671	0.491 0.680		0.324 0.408	0.579 1.000	0.383 0.490	0.491 0.981
F5	0.490 0.370	0.769 0.263	0.382 0.362	0.676 0.749		0.699 0.926	0.613 0.333	0.779 0.907
F6	0.532 1.000	0.301 0.576	0.301 0.603	0.421 1.000	0.301 1.000		0.301 0.636	0.412 0.455
F7	0.532 0.609	0.602 0.319	0.396 0.349	0.617 0.847	0.387 0.569	0.699 0.822		0.779 0.803
F8	0.421 0.783	0.301 0.457	0.101 0.502	0.509 1.000	0.221 0.841	0.588 0.497	0.221 0.452	

F1-F8 = faculties 1-8

The method involves calculating the difference between concordance and discordance indicators, establishing the relationship of takeover presented in Table 5 and graph from Figure 3.

You can see that the graph of Figure 3 contains arches directed from node F3 to all the others, which leads us to the conclusion that **F3 is the optimum variant**, overtaken by all the others.

Table 5

Relation of superiority

	F1	F2	F3	F4	F5	F6	F7	F8
F1		0	0	0	0	0	0	1
F2	1		0	0	0	1	0	0
F3	1	1		1	1	1	1	1
F4	1	1	0		0	1	1	1
F5	1	1	0	1		1	1	1
F6	1	0	0	0	0		0	0
F7	1	1	0	0	0	1		1
F8	0	1	0	0	0	1	0	

F1-F8 = faculties 1÷8

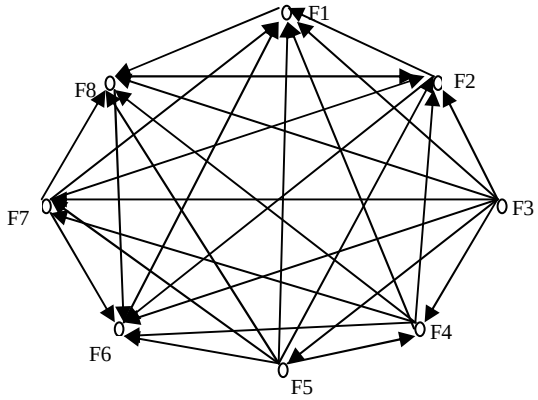

Figure 3

Relation of superiority

To facilitate the study, an information program was created (written in FoxPro language), which incorporates afferent data from 10 criteria from a database, the percentage of every criteria from another database and it covers all stages of analysis and hierarchy described for Electra method, generating a table containing relations of over classing (tab.5).

CONCLUSIONS

The existence of methodology for defining and tracking of performance indicators, allows:

- comparative approaches easy to be quantified;
- reporting negative aspects that could be corrected;
- developing strategies based on rigorous information;
- establishing weak and strong points in the university's evaluation.

The system of indicators proposed in this study may receive corrections and essential modifications, but it offers a model of approaching the issue of indicators, especially a hierarchical model.

The main idea of this study is not to make a ranking, but to present a way of scientifically approaching the problem by continuously improving the activities at the level of university management.

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