# A methodological proposal to assess the performance of the Brazilian faculty members

**D.Sc. Márcia Helena Veleda Moita**
Professor at Federal University of Amazonas - UFAM
Av. General Rodrigo Otávio Jordão Ramos, 3000. Campus Universitário. Manaus-AM. 69077-000. Brazil
marciamoita@ufam.edu.br

**Abstract**

*The university pedagogy in Brazil is carried out by faculty members who have no sole identity. Its characteristics are extremely complex. It is characterized by diversity, by plurality of options, paths, alternatives, interests and tensions. Thus, the measure to assess the performance of the faculty member has to take into account such characteristics. A model that assesses the technical efficiency of the faculty member bearing in mind the utility he and his colleagues assign to the academic production has been developed. For the construction of such a frontier a technique known as Data Envelopment Analysis – DEA was used. The ranking for the faculty members was established with the use of two hierarchization procedures: according to the vocation of the faculty member, namely, according to the emphasis he gives to the output he generates; or, according to the characteristics of a specific facet, namely, giving emphasis to some academic activities.*

**Keywords**: Faculty Member, Production Frontier, Data Envelopment Analysis.

## 1. Introduction

The university pedagogy in Brazil is carried out by faculty members having no sole identity. Its characteristics are extremely complex. It can be said that the college faculty members work in different types of institution, they develop in them activities which are qualified in different ways, he faces the most varied tensions, and he shows different relations with knowledge, whether to produce it or to disseminate it. It is characterized by diversity, by plurality of options, paths, alternatives, interests and tensions. Thus, the measure to assess the performance of the faculty member has to take into account such characteristics.

The globalized world has given priority to internationalization based on the information society, on standards of excellence and in the presence of the Assessing State. With the implementation of the higher education national assessment system, the evaluation of the performance of faculty members has begun. In the universities, the models for assessing the performance of faculty members are based, by and large, on opinion scales or on questionnaires answered by students, and such evaluation has been seen as an indicator (often the only one executed) of the teaching quality.

Other assessment models are based on methods which are traditionally used to assess the productivity of faculty members and researchers, as for example, the method of review by colleagues –

Peer Review System. According to some experts this method has some limitations and many criticisms are leveled against it.

In summary, the existing formats to assess the Brazilian faculty member commonly found in the literature are based on students' opinions of the performance of the faculty member and/or on reviews made by peers, along with the CNPq assessment executed by its advising committees. Thus, performance of the faculty member is established vis-à-vis the standards which are laid down by the assessing agencies and institutions. Therefore, the performance of the faculty member is measured against the criteria and weights which are relevant to the assessor. No institution assesses in accordance with the utility of the faculty member, that is, bearing in mind the values he assigns to different academic activities develops in the universities.

This research develops a model to assess the performance of the Brazilian faculty member from the multi-dimensional perspective of their academic activities taking into account:

a) The utility function of his production, and/or;

b) An "evaluation standard" established by their peers which will ensure impartiality.

c) Productivity measures constructed through Data Envelopment Analysis - DEA.

## 2. The Faculty Member Conceptual Model

This work considers as a faculty member all those who work in an institution considered to be a University and therefore should include teaching, research and extension activities, as well as those who participate in purely administrative activities.

The faculty member is a rational being and, therefore, tries to efficiently allocate their resources, and transform them into the required outputs of their developed activities. The faculty member can, therefore, be represented as sketched in Figure 1.

## 3. The Construction of the Frontier of the Faculty Member's Technical Efficiency

In the academic production process, the faculty member aims to make use of the available resources or inputs and transforms them into outputs of greater value. Such a transforming process is, above all, a technological relationship between inputs whose resulting outputs can then be represented by a production function.

The academic practice can, then, be seen as a production system that transforms N types of inputs into M types of outputs which determine the efficiency of the faculty member's carried out operational plan.

This way, the model developed to assess the technical efficiency of each faculty member, constructs a production frontier that takes into account the multiple activities carried out by the faculty member, and therefore the productivity of each faculty member under analysis is given by:

$$P = \frac{p_i \text{ x teach.outputs} + p_j \text{ x resear.outputs} + p_l \text{ x exte.outputs} + p_m \text{ x manag.outputs}}{q \text{ x inputs}}$$ where:

$p_i$, i=1,2..I, are weighted vectors for the aggregation of the outputs relative to the teaching activities;

$p_j$, j = 1, 2,...J, are weighted vectors for the aggregation of the outputs relative to the research activities;

$p_l$, l = 1, 2, ...L are weighted vectors for the aggregation of the outputs relative to the extension activities;

$p_m$, m = 1, 2, ...M, are weighted vectors for the aggregation of the outputs relative to the management activities

$q_n$, n = 1, 2, ...N, are weighed vectors for the aggregation of the used inputs.

These **p** and **q** weights are specific substitution indexes for each faculty member and represent the values of the activities assigned to them. To obtain such values the faculty member can be asked what importance (weights) they assign to their university activities. A measure of absolute productivity for each faculty member can thus be obtained, where productivity measure **p** and **q-**weighed vectors represent the characteristics and peculiarities which are specific to each faculty member, namely, the utility they assign to their diverse academic activities. However, this process becomes unfeasible due to the difficulty in getting into contact with faculty members and/ or obtaining from them accurate information on judgments made at the time, to decide on developing one or another activity. The difficulty in finding out an absolute output measurement has led this research into working with relative output measures. Thus, for the construction of the frontier that would allow for the assessment of the efficiency of a faculty member from the perspective of the utility he assigns to his academic production, the Data Envelopment Analysis – DEA technique was used.

### 3.1 Calculus of the technical efficiency indicator

The use of DEA to calculate the relative productivity of a specific faculty member requires, as reference, a group of faculty members exhibiting a similar academic behavior in the selection of developed activities.

In order to formally conceptualize the technical efficiency measured by DEA, consider the practice of the faculty member as a multiple output system that transforms N inputs represented by the quantity vector $X = (x_1, x_2, ...x_N) \in R^N$ into M outputs, whose quantities are represented in a vector $Y = (y_1, y_2,...,y_M) \in R^M$, determining the operational plan described by vector $(x,y) \in R^{N+M}$. Suppose that K operational plans were observed $(x^k,y^k)$, k = 1, 2, ...K, performed by K faculty members. Let the amount of resources used i (i = 1, 2, 3,...N) be assigned by $x_{ki}$ and $y_{kj}$ , and the amount produced of output j (j = 1, 2, 3, ...M). The faculty member under assessment is represented by the operational plan $(x^0,y^0)$.

DEA begins by constructing a productivity measure for each faculty member having the following expression:

$$P_r^0 = \frac{\sum_{j=1}^{M} p_j Y_{oj}}{\sum_{i=1}^{N} q_i X_{0i}}$$

where $p = (p_1, p_2, ...,p_M)$ and $q = (q_1, q_2,..., q_N)$ are weighted vectors used for the aggregation of the inputs and outputs of each faculty member being assessed. Number $P_r^0$ is a measure of productivity of the assessed faculty member, as it is a “ratio” between the accrued output and the accrued consumption of the faculty member, calculated as **p** and **q** technical substitution indexes specific for this faculty member.

The association of a set of specific weights for each faculty member permits a definition of a measure of productivity specific for the faculty member under assessment. The DEA technique allows for the determination of vectors with ($\mathbf{p}^*$, $\mathbf{q}^*$) weights corresponding to the technical substitution indexes among the inputs and the outputs for the faculty member under assessment. Thus, the ($\mathbf{p}^*$, $\mathbf{q}^*$) weights can reproduce the utility each faculty member assigns to the output plan carried out by them.

The determination of the $\mathbf{p}^*$ and $\mathbf{q}^*$ weights for the faculty member under assessment are found by maximizing the $E^0$ relative productivity value through the following mathematical programming problem:

$$\text{Max } E^0 = \frac{\sum_{j=1}^{M} p_j Y_{0j}}{\sum_{i=1}^{N} q_i X_{oi}}$$

$$\text{s/a} \quad E^j = \frac{\sum_{j=1}^{M} p_j Y_{kj}}{\sum_{i=1}^{N} q_i X_{ki}} \leq 1 \quad \forall\, k = 1, 2, 3, ..., K$$

$$p_j > 0 \quad \forall\, j = 1, 2, 3, ..., M$$

$$q_i > 0 \quad \forall i = 1, 2, 3, ..., N$$

As the plan $(x^0,y^0)$ is one of the observed K plans, then the greater value for the determined $E^0$ with weights ($\mathbf{p}^*$,$\mathbf{q}^*$) is always less or equal to 1, for the greater relative productivity $E^j$ reached with the observed operational plans is always equal to 1. This way, the optimal value of $E^0$ can be interpreted as an indicator of relative efficiency of the operational plan $(x^0,y^0)$. When $E^0$ is equal to 1, the operational plan $(x^0,y^0)$ is efficient, for with the substitution indexes ($\mathbf{p}^*$,$\mathbf{q}^*$) the productivity of the plan $(x^0,y^0)$ is the greatest among the productivities of the observed plans. Otherwise, if $E^0 < 1$, the operational plan $(x^0,y^0)$ is inefficient, for any set of substitution indexes (**p**,**q**), there is an observed operational plan with $E^j = 1 > E^0$ relative productivity, since $E^0$ is the maximum relative productivity of the plan $(x^0,y^0)$ for any vector (**p**,**q**). Thus, the efficient faculty members characterize the efficiency frontier and constitute references vis-à-vis the other faculty members.

## 3.2 Analysis of the DEA results

### 3.2.1 The efficiency indicator

The efficiency indicator calculated for each faculty member corresponds to output oriented radial measure assumes values greater or equal to 1.

When the efficiency indicator is equal to 1, the faculty member is efficient and there are no indications in the increase of his productivity with such variables and this set of references. The group of efficient faculty members determines the efficiency frontier against which the inefficiency of the other faculty members is measured.

### 3.2.2 The efficiency frontier

The efficient faculty members characterize the efficiency frontier and constitute the references in relation to which the other operational plans are projected. The characteristics of the efficient faculty members determine the characteristics of the frontier and are reflected on the emphasis the faculty members assign to their developed activities. For an analysis of such emphases it is necessary to know the reasons which secure the efficiency condition of the references. For such an analysis, the partial productivities are used, in which the productivity function of the faculty member is decomposed.

### 3.2.3 The facets of efficiency

The efficiency facet associated with each inefficient faculty member is delimited by his referential faculty members (vertexes) and characterized by value relationships (relative importance among the variables).

The efficiency indicator relative to each faculty member calculated by the DEA models corresponds to the distance between the effective operational plan and the efficiency frontier. The frontier comprises linear sections referred to as efficiency facets, determined by combinations of subsets of efficient faculty members.

The efficiency facets are characterized by a set of vertexes and a set of substitution indexes among variables. The vertexes define the limits of each facet whilst the substitution facets reflect value relationships among the variables and describe the equilibrium conditions (optimality) that guarantee the efficiency condition.

The vertexes of the facet are the referential efficient faculty members for the assessed faculty member.

The substitution ratios are expressed into the DEA model dual variables and represent marginal productivities which provide the weighting used in the aggregation of the inputs and outputs. Such ratios define the production functions which determine the efficiency frontier. For each assessed faculty member, the substitution ratios describe the production relationships associated to their facet in the frontier of production possibilities.

In the assessment of productivity of a faculty member, the substitution ratios are interpreted as indicators of the relative importance of the inputs and the outputs the faculty member assigns to the observed operational plan.

Thus, the DEA technique allows each faculty member to search for the identification of the individual values assigned to his academic activities, that is it allows for the determination of the utility function of his developed activities (the optimal substitution ratios **p** and **q** which would maximize his relative efficiency). This way, these weights (or optimal substitution ratios) can reflect the values and constraints taken into account by each faculty member at the time of making the decision relative to their academic work. The faculty member will only be considered inefficient if another faculty member or members were to obtain with their weightings a greater productivity.

For each inefficient faculty member the DEA technique identifies a group of efficient faculty members forming a reference group for the analysis of the performance of the faculty member under assessment. These referential faculty members determine a facet of the efficiency frontier. This facet represents the benchmark for the assessed faculty member, and his optimal weights represent the substitution ratios of the relationships among the variables. This way, each facet determines the utility that the faculty members comprising it, assign to their inputs and outputs. The inefficient are projected to one such facets. Thus, the faculty members can be grouped in accordance with the emphasis each one assigns to his developed activities respecting his interest and dedication to teaching, research, extension and managerial activities. This way, each faculty member is assessed according to the productivities calculated with their own substitution ratios. An assessment of each faculty member in the analysis is executed under his own point of view and respecting his own specific interests and characteristics.

Alternatively the faculty members are assessed in accordance with the emphasis one wishes to give the assessment, namely, the calculation of the relative productivity of each faculty member is obtained with the use of a set of common weights (p and q optimal multipliers) associated to a determined efficiency facet. A "valuation standard" representing the utility his peers assign to the desired emphasis is then used.

## 4. Teaching Performance: Case of the faculty members from the engineering area

The source of data for this research is the **Diretório dos Grupos de Pesquisa no Brasil, versão 4.0** made available by the CNPq (www.cnpq.gov.br). This application is limited by the available dataset.

With regard to knowledge area only faculty members from the Engineering area were selected, since this area, in addition to having a significant number of academic staff is, also quite homogeneous in their research work.

With regard to titles, the sampled members chosen were all doctors and are involved in the postgraduate programs. This ensures that they all have the same conditions in the production of their results, which means they all have the same range of outputs.

The only available variables in the dataset (number of qualifications as masters and doctors per academic staff, published papers in scientific journals, works published at conferences, published books and chapters in books), can be considered as descriptive of the teaching and/or research activities.

No descriptive variables were found relative to extension and managerial activities due to limitations of the dataset.

Thus, four variables considered as output or result variables of teaching and /or research activities developed by faculty members were selected from the existing databank.

The used resources variables employed by faculty members are not available in the dataset. Therefore, time of dedication by the faculty member was considered as input. An option was made to consider total dedication to work as the labor regime in force, that is, all the sampled faculty members had the same work contract, which have allowed them to have the same possibilities. This ensures that all of them had the same time to allocate to their developed activities. 199 faculty members were selected from the available dataset.

### 4.1 The model of academic performance

The empirical model considers a production function that takes into account four outputs and one sole input. The results are: publication in <u>journals</u>; participation in <u>conferences</u> and other scientific events; publication of <u>books</u> and chapters in books; and <u>qualification</u> as masters and doctors. The input is <u>time</u> of dedication of the faculty member to the teaching activities. The academic productivity Pr is therefore measured by:

$$\Pr = \frac{p_1 \text{x Journals} + p_2 \text{x Conferences} + p_3 \text{x Books} + p_4 \text{x Qualification}}{\text{q x Time}},$$

Where, $p_1$, $p_2$, $p_3$, $p_4$ and q are exchange and substitution ratios specific to the faculty member under assessment, which express the relative utility assigned by him to the executed activities.

**4.2 The CCR faculty member performance frontier**

Upon analysis of the DEA results it has been observed that several faculty members have assigned zero value to their outputs. A conclusion might be that the CCR faculty member performance frontier may not be adequate either to assess faculty members, or consequently to rank them. As a result limitations should be applied to the multipliers.

**4.3 The DEA-DT faculty member performance frontier**

The possibility of differentiation of the multipliers is taken into account in the DEA technique, since such a technique identifies the most adequate multipliers in order to classify as efficient the observed operational plans. However, such a possibility should not allow for a totally free choice, since the multipliers should be compatible with the cultural, social and geographic characteristics of the productive contexts within which the decisions taken to execute the observed operational plans were made. Therefore, it is necessary to allows for the establishment of some form of control in the identification of the multipliers associated to each observed plan.

Dyson & Thanassoulis (1988) in their model have taken into account a sole input and have established limits for the substitution ratios among products taking into account the need of having consumed a minimum quantity of input for each unit of generated output. This model relates to a basic CCR model as described in figure 2 and figure 3, which uses a sole input for the generation of P outputs.

In summary, in the case of a sole input, the multiplier $\overline{p_j}$ , p = 1, 2, ..., P can always be interpreted as being the quantity of input spent in the efficient generation of a product p unit, which interpretation allows for the justification of the quantification of the limits for the outputs multipliers.

**4.4 The limits of the multipliers**

All the faculty members in this research dedicate themselves exclusively to the teaching activities. This way, one can adopt $x_0 = 1$ for all the faculty members without loss of generality. Therefore, in the DEA-DT model the multiplier $\overline{p}_j = p_j / q$ associated to the j output can be interpreted as being equal to the fraction of time that the faculty member applies to the generation of a unit of such output.

Given this interpretation, the minimum fraction of time necessary to generate a unit of j output can be used as the lower limit of the multiplier $\overline{p}_j$. The most adequate would be to apply the experts' consensus technique to fix such minimum fractions. However, the cost and the necessary time for the application of this technique would make its use prohibitive in this research.

As already mentioned, the total flexibility in the weights permits that many faculty members to associate zero multiplier to some outputs with the purpose of maximizing their relative productivity. This valuation, however, is inconsistent before the interpretation of the optimal multiplier being the fraction of time the faculty member spends in generating an output unit; it is not possible to admit that such fraction be zero. The minimum fraction of time was, therefore, adopted to generate a j output unit to half the average fraction of time by taking into account the list of all the assessed faculty members.

**4.5 The referential faculty members and the facets**

A new faculty member performance frontier was constructed by imposing such limits to the CCR-DT model. Reviewing the most relevant computer results for the determination of the CCR-DT faculty member frontier and, consequently, for the ranking of the assessed faculty members, it was observed that faculty members 52, 136, 168, 184, 197 and 198 are efficient. Table 1 lists these six efficient faculty members associating them to the fractions of time spent to generate a unit of each output.

The 193 inefficient faculty members are divided into 12 groups defined by the referential faculty members. Table 2 shows these groups and the frequency with which the efficient faculty members appear vis-à-vis the inefficient ones. Figure 3 illustrates, in the plan, the spatial dispersion associated to these groups and allows for the verification that nine of them are subgroups of three main groups (i, ii, iii), which correspond to the facets which define the CCR-DT faculty member performance frontier. Table 3 characterizes such facets.

The analysis of Table 3 and of the relevant computer results allows for verifying that the inefficient faculty members associated to:

- **Facet 1**, give emphasis to research, since this facet has characteristics of being constituted of faculty members who dedicate a major part of their time to publication;
- **Facet 2**, give emphasis to the participation in conferences, since this facet is constituted of faculty members who assign greater value to the "participation in conferences" variable;
- **Facet 3**, give emphasis to publication of books and chapters of books and to the qualification of masters and doctors, since this facet is constituted of faculty members who assign greater value to activities of student qualification and the publication of books and of chapters of books.

**4.6 Ranking of faculty members**

The constructed DEA-DT faculty member frontier permits the ranking of faculty members according to their total relative productivity, since the frontier is defined by list of optimal multipliers that characterize the productive efficiency. It is necessary, however, that the ranking process employs the same list of optimal multipliers, that is that the ranking is carried out through a valuation standard.

The process of faculty member ranking comprises two steps. In the first step:

a) A list of efficient multipliers is selected;
b) The total relative productivities of the faculty members are calculated;
c) The faculty members are ranking in accordance with their total relative productivity.

In the second step the ranking criteria are selected and applied to the list of faculty members.

The faculty members ranking criteria are numerous and depend on the purpose of the desired ranking. The position of the faculty member in the associated statistic distribution was adopted in this research associated to the list of faculty members, increasingly ordered as to their overall relative productivity, taking into account that such criterion is solely dependent on the observed data.

Amongst the numerous forms of establishing classes in the list of faculty members, that transcribed in Table 4 based on the quartiles was chosen, given the illustrative character of the empirical research.

**4.7 The classification prisms**

Each facet of the faculty member performance frontier is characterized by a list of optimal multipliers corresponding to a distinct emphasis in the generation of academic outputs. Therefore there are two elementary procedures for the classification of the faculty members: according with the vocation of the faculty member, that is, according to the emphasis he assigns to the output he generates; or according to the characteristics of the emphasis of a specific emphasis, that is, given emphasis to some university activities.

In the first case, the faculty members should be grouped in accordance with the focus they give to their teaching activities, as determined by their optimal multipliers. Thus, as many categories as there are facets of the DEA-DT efficiency frontier can be defined. In the second case, all the faculty members are assessed as per the desired focus by using the same set of optimal multipliers. This way, as many focuses as there are DEA-DT efficiency frontier facets can be defined.

**4.7.1 Ranking according to the vocation of the faculty member**

The DEA-DT faculty member's performance frontier has three facets. It is possible, therefore, to partition the faculty members set into three categories.

Category I – faculty members who give emphasis to research are characterized by the high utility assigned to publications in journals and by Facet 1.

Category II – faculty members who give emphasis to scientific events as characterized by the high utility assigned to publication of works in conferences and by Facet 2.

Category III – faculty members who give emphasis to teaching and the publication of books and chapters in books are characterized by the high utility assigned to qualification of masters and doctors combined with the publication of books and chapters in books associated to Facet 3.

Table 5 presents the ranking of faculty members in the respective categories and levels.

**4.7.2 Ranking according to the emphasis characteristic of a facet in the CCR-DT faculty member performance frontier**

The three facets of this frontier are characterized by the optimal multipliers (Table 3) and their emphasis. This way, the faculty members' relative productivities were calculated with the use of the optimal multipliers associated to these efficient facets, namely, with the use of a set of common weights found by their peers. Three distinct rankings were obtained, giving emphasis to research, emphasis to scientific events and emphasis to teaching and books.

Table 6 ranks faculty members according to the emphasis adopted in the assessment and shows, also, the ranking of the faculty member in accordance with his vocation.

For instance, faculty member 77 is an inefficient professor who has his efficient target projected towards Facet 1. His classification by vocation is IB, namely, this faculty member is more interested in doing research, and he is then being compared with professors within this group. His level is B since his relative productivity is positioned between the 1$^{st}$ and the 2$^{nd}$ quartile in the list of relative productivities of the faculty members in this group. Otherwise, being assessed by his peers, using a valuation standard assigned by them in compliance with emphasis such as research, scientific events, teaching and books, his classification is B, D and C, respectively.

## 5. Conclusion

The most adequate academic performance frontier to the application was constructed from the DEA-DT model, since such frontier has allowed us to work with implication on the weights, namely, a lower limit for the substitution rates was established, thus, not allowing the assignment of zero values to the activities developed by the faculty member.

The technical efficiency indicators constructed from such a model have classified six faculty members as efficient. The frontier for faculty member performance was defined by three master facets (Facet 1, Facet 2 and Facet 3), which the inefficient faculty members were projected against. Faculty members associated with Facet 1 are those who give emphasis to research, those in Facet 2 give emphasis to the participation in Conferences, in Facet 3 give emphasis to the publication of books and chapters in books 3 give emphasis to the publication of books and the qualification of masters and doctors.

The constructed DEA-DT faculty member academic performance frontier has allowed for the classification of faculty members according to their total relative productivity. Each facet of this frontier is characterized by a cast of optimum multipliers corresponding to a distinct emphasis in the generation of the faculty members' output. The classification of faculty members has been established with the use of two procedures for ranking: according to the vocation of the faculty members, that is, in accordance with the emphasis he/she gives to the output he/she generates; or according to the characteristics of one specific facet, that is, giving emphasis to some academic activities.

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**FIGURES**

**Figure 1**

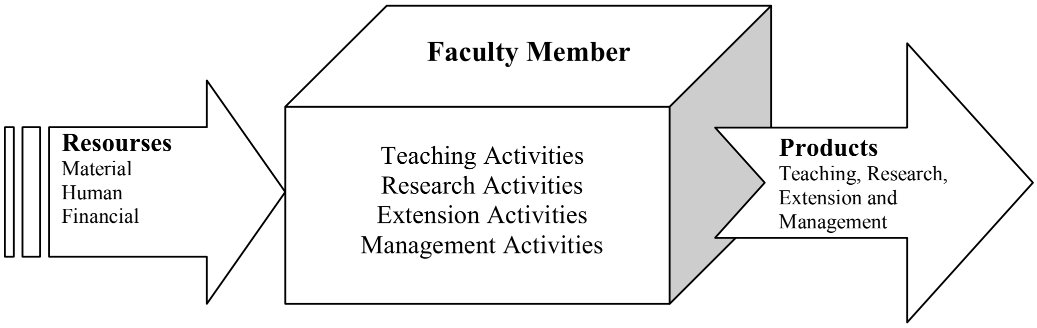



**Figure 2**

$$\text{Max } E^0 = \frac{\sum_{j=1}^{M} p_j Y_{0j}}{qX_0} = \frac{\sum_{j=1}^{M} \left( p_j / q \right) Y_{0j}}{X_0}$$

$$\text{S/a} \quad E^j = \frac{\sum_{j=1}^{M} p_j Y_{kj}}{qX_k} = \frac{\sum_{j=1}^{M} \left( p_j / q \right) Y_{kj}}{X_k} \leq 1$$

$$\forall\ k = 1, 2, 3, ..., K$$

$$P_j > 0 \quad \forall\ j = 1, 2, 3, ..., M;$$

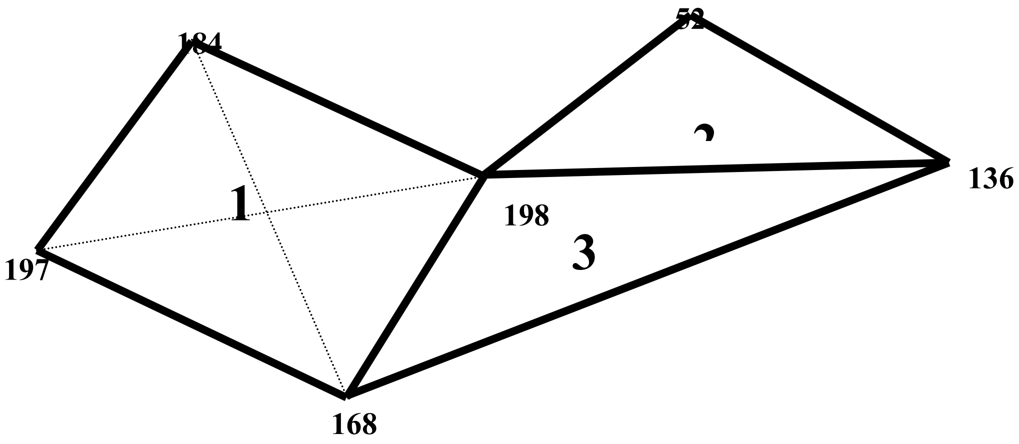
**Figura 3**

$$\text{Max } \overline{E^0} = \frac{\sum_{j=1}^{M} \overline{p_j} Y_{0j}}{X_0}$$

$$\text{S/a} \quad E^j = \frac{\sum_{j=1}^{M} \overline{p_j} Y_{kj}}{X_k} \leq 1 \quad \forall\ k = 1, 2, 3, ..., K$$

$$Li < \overline{p_j} < Ls \quad \forall\ j = 1, 2, 3, ..., M;$$

**Figure 4**




**TABLES**

**Table 1**

| Faculty member | Fraction of time*100 | | | |
|---|---|---|---|---|
| K | Journal* | Conferences* | Books* | Graduated* |
| 52 | 3,41 | 0,91 | 5,25 | 0,96 |
| 136 | 1,73 | 0,82 | 7,02 | 0,96 |
| 168 | 4,38 | 0,45 | 7,20 | 0,96 |
| 184 | 4,33 | 0,26 | 2,59 | 0,96 |
| 197 | 4,38 | 0,45 | 7,20 | 0,96 |
| 198 | 4,38 | 0,45 | 7,20 | 0,96 |

**Table 2**

| **Groups** | **Referential faculty members** | | | | | |
|---|---|---|---|---|---|---|
| | **52** | **136** | **168** | **184** | **197** | **198** |
| I | x | x | | | | x |
| Ii | | x | x | | | x |
| Iii | | | x | x | x | x |
| Iv | | x | | | | x |
| V | | | | | | x |
| Vi | x | | | | | x |
| Vii | | x | x | | | |
| Viii | | | x | | x | x |
| Ix | | | | | x | X |
| X | | | x | x | | X |
| Xi | | | | x | x | x |
| Xii | | | x | x | x | |
| Frequency | 0,39 | 0,55 | 0,28 | 0,14 | 0,25 | 0,95 |

**Table 3**

| **Facets** | **Referential faculty members** | | | | | | **Optimal multipliers*100** | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | $p_1$* | $p_2$* | $p_3$* | $p_4$* | q* |
| **1** | | 136 | 168 | | | 198 | 4,60 | 0,48 | 14,73 | 6,06 | 185,01 |
| **2** | 52 | 136 | | | | 198 | 8,80 | 2,34 | 13,54 | 2,47 | 258,30 |
| **3** | | | 168 | 184 | 197 | 198 | 16,30 | 0,985 | 29,064 | 5,41 | 375,36 |

**Table 4**

| Position of the faculty member | **Ranking level** |
|---|---|
| Up to the 1st. quartile | A |
| From the 1st. Quartile to the 2nd. Quartile | B |
| From the 2nd. Quartile to the 3rd. Quartile | C |
| Over the 3rd. Quartile | D |

**Table 5**

| Level | **Category I** | **Category II** | **Category III** |
|---|---|---|---|
| **A** | 21, 26, 30, 34, ... | 45, 48, 49, 50, ... | 42, 43, 63, 92, ... |
| **B** | 59, 77, 103, 145... | 20, 29, 37, 40, ... | 3, 4, 60, 79, ... |
| **C** | 81, 82, 83, 84, | 13, 14, 15, 23, | 96, 101, 107, 108, ... |
| **D** | 53, 54, 55, 56, ... | 1, 2, 5, 6, ... | 72, 78, 86, 87, ... |

**Table 6**

| **Faculty member** | **Ranking through emphasis on Research** | **Ranking through emphasis on Scientific Events** | **Ranking through emphasis on Teaching and Books** | **Ranking through Vocation** |
|---|---|---|---|---|
| | **Level** | **Level** | **Level** | **Category and Level** |
| 1 | D | C | C | IID |
| 3 | C | C | B | IIIB |
| 4 | C | C | B | IIIB |
| 5 | D | C | D | IID |
| 7 | D | C | D | IID |
| … | … | … | … | ... |
| 42 | A | A | A | IIIA |
| 43 | A | A | A | IIIA |
| 77 | B | D | C | IB |
| .... | .... | ....... | .... | ..... |

**Figures**



**Tables**