

## Profile and Productivity of Researchers in The Area of University Management

Liária Nunes-Silva; Alan Malacarne; Ricardo Fontes Macedo; Washington Sales do

Monte; José Walter Silva e Silva; Robelius De-Bortoli

### Abstract

This aims of this article is to identify the profile and degree of productivity of researchers in University Management in the periodical University Management in Latin America (GUAL), in the five-year time frame (2012-2017). For this purpose, the principles of Lotka's bibliometric Law, also known as the Lotka's Inverse-Square Law ( $1/n^2$ ), as well as the adjustment of the Inverse-Square proposed by Price ( $1/n^3$ ) were used methodologically to degree of productivity of researchers in the area. The information to trace the professional profile of the researchers was collected in the Lattes Platform of the National Council of Scientific and Technological Development (CNPq). The main results indicated that there is a strong collaboration between the authors in the development of the research and that the majority of researchers in the field are male. They also showed that universities are the institutions that most develop research on the subject and that there are indications of the existence of an elite of researchers on University Management. The results demonstrated that the studied researchers are mostly master and doctoral teachers, graduates or post-graduates in administration. The results indicate that the researchers are qualified and that they possess technical and / or scientific knowledge about the management of complex institutions, being able to contribute with the development of management models or management support tools.

**Keyword:** University Management; Higher Education Institutions; Professional Profile; Bibliometrics.

**Published Date:** 4/30/2019

**Page:** 209-226

**Vol 7 No 4 2019**

**DOI:** <https://doi.org/10.31686/ijer.Vol7.Iss4.1401>

## **Profile and Productivity of Researchers in The Area of University Management**

### **Liária Nunes-Silva (Corresponding author)**

Federal University of Sergipe - UFS / Post-Graduation Program in Intellectual Property Science -  
PPGPI; Teacher at the Federal Institute of Piauí

Human Cognitive Knowledge Research Laboratory – LADEC

[liaria.nunes@ifpi.edu.br](mailto:liaria.nunes@ifpi.edu.br)

Telephone: +55 89 99977-0071

<https://orcid.org/0000-0002-0666-249X>

<http://lattes.cnpq.br/5938755875411138>

Graduated in Administration - FCP; Master of Science in Intellectual Property; PhD student in  
Intellectual Property Science - UFS.

### **Alan Malacarne**

Federal University of Sergipe - UFS / Post-Graduation Program in Intellectual Property Science -  
PPGPI

Human Cognitive Knowledge Research Laboratory – LADEC

[alanmalacarne1988@gmail.com](mailto:alanmalacarne1988@gmail.com)

Degree in Physical Education - UNESC; Master of Science in Intellectual Property; PhD Student in  
Intellectual Property Science – UFS

### **Ricardo Fontes Macedo**

Federal University of Sergipe - UFS / Post-Graduation Program in Intellectual Property Science -  
PPGPI

Human Cognitive Knowledge Research Laboratory – LADEC

[ricardo10fontes@gmail.com](mailto:ricardo10fontes@gmail.com)

Bachelor of Physical Education - UFS

Master in Physical Education - UFS; Doctor of Science of Intellectual Property – UFS

### **Washington Sales do Monte**

Federal University of Sergipe - UFS / Post-Graduation Program in Intellectual Property Science -  
PPGPI

Human Cognitive Knowledge Research Laboratory – LADEC

Graduation in Marketing - UNP

Master in Environment, Technology and Society - UFERSA

[wsalesmkt@gmail.com](mailto:wsalesmkt@gmail.com)

**José Walter Silva e Silva**

Federal Institute of Piauí - IFPI / Post-Graduation Program in Education – PPGE

waltersilva@ifpi.edu.br

Bachelor of Economics – FACCEBA; Master in Education – UNINOVE; PhD Student in Education – UNINOVE

**Robelius De-Bortoli**

Federal University of Sergipe - UFS / Department of Physical Education - DEF / Post-Graduation

Program in Intellectual Property Science - PPGPI

Human Cognitive Knowledge Research Laboratory – LADEC

ladec.ufs@hotmail.com

<http://orcid.org/0000-0003-1231-6451>

<http://lattes.cnpq.br/3009425852002651>

Degree in Physical Education - UFRGS; Specialist in Football Administration and Marketing - UGF; PhD in Science of Physical Activity - UNILEON; Post-Doctorate from the University of Costa Rica.

**Abstract**

*This aims of this article is to identify the profile and degree of productivity of researchers in University Management in the periodical University Management in Latin America (GUAL), in the five-year time frame (2012-2017). For this purpose, the principles of Lotka's bibliometric Law, also known as the Lotka's Inverse-Square Law ( $1/n^2$ ), as well as the adjustment of the Inverse-Square proposed by Price ( $1/n^3$ ) were used methodologically to degree of productivity of researchers in the area. The information to trace the professional profile of the researchers was collected in the Lattes Platform of the National Council of Scientific and Technological Development (CNPq). The main results indicated that there is a strong collaboration between the authors in the development of the research and that the majority of researchers in the field are male. They also showed that universities are the institutions that most develop research on the subject and that there are indications of the existence of an elite of researchers on University Management. The results demonstrated that the studied researchers are mostly master and doctoral teachers, graduates or post-graduates in administration. The results indicate that the researchers are qualified and that they possess technical and / or scientific knowledge about the management of complex institutions, being able to contribute with the development of management models or management support tools.*

**Keywords:** University Management; Higher Education Institutions; Professional Profile; Bibliometrics.

**1. Introduction**

The process of attracting the Brazilian middle class to Higher Education Institutions (HEI) began in the 1960s, due to the increase in the demand for specialized labor, caused by the expansion of the activities of

multinational companies in the national economy. It is in this socioeconomic context that the implementation of the University Reform of 1968 occurs that will profoundly mark Brazil's higher education, especially in relation to the expansion of the private education network. This Reform, perceived as necessary for the preservation of the so-called "Economic Miracle" (Almeida de Carvalho, 2007) was promoted by the Military Regime through Federal transfers and fiscal incentives.

Among the results of the implementation of the University Reform of 1968, the following stand out: i) the modernization of non-profit public and private universities, which occurred through a series of proposals focused on the articulation between teaching and research, postgraduate policies and the establishment of the teaching career; ii) the expansion of a business model focused on private higher education, formed by a series of isolated small enterprises. The unrestrained process of mergers between these small enterprises outlined the current model of the "market for educational services" characterized by large educational enterprises and private for-profit universities (Martins, 2009).

The current model of HEIs was also analyzed by Carvalho (2013), who highlighted the strategies of these institutions, especially the private ones, in the search for competitive advantages, such as the enterprise reorganization in conglomerates aiming at greater participation in the market; the adoption of aggressive marketing strategies focused on attracting new customers; the opening of capital on stock exchanges; the internationalization of companies by means of partial sale to international groups; and the professionalization of the management system.

Faced with a scenario marked by competitiveness and the absence of management tools specially directed to the sector, educational organizations started to import tools to support the strategic management of diverse business segments, such as strategic planning and Balanced Scorecard (BSC). Thus, the use of these tools began to be used in consortium with the main strategic management tool of Brazilian HEIs, the Institutional Development Plan (IDP). The IDP is a formal document that guides the actions of the institution for a period of five years, observing the consonance between the mission, objectives, goals and organizational strategies (Brasil, 2006; Meyer Jr, Pascucci, & Mangolin, 2012).

The effectiveness of HEIs in meeting the demands of their stakeholders and the pressures of the external environment depends, in large part, on the way their academic-administrative activities are developed. Therefore, the focus of university management is to promote the improvement and quality of its processes, seeking to respond, assertively, to the needs and expectations of the institution (Piñero, Bravo, & Carrillo, 2014).

Due to the importance of university management for the development of HEIs, researchers from different areas of knowledge see developing studies on the subject and publishing in periodicals around the world, which contributes to a wide and diverse scientific production. Despite the volume of scientific production that involves this subject, a challenge still to be overcome refers to the knowledge about the professional profile and the degree of productivity of these researchers.

As a way to overcome challenges of this order, bibliometry presents itself as an efficient tool in the production of quantitative information, able to parameterize the productivity of researchers quoted in several databases. It is based on statistical treatments on the volume of academic production, from variables such as authors, relevance of periodicals and keywords. According to Mueller (2013), bibliometric studies

are aimed at obtaining data on authorship and co-authorship, collaboration and networks in the development of scientific papers, literature evaluation and description, impact and indicators, production and productivity, authors and institutions visibility, citation and cocitation.

Centered in the quantitative data collection on the production, diffusion and application of information, bibliometric studies contribute to the development of scientific production, since they reveal the gaps, trends, as well as the state of the art of the different areas of knowledge (Medeiros, & Vitoriano, 2015). Among the main laws used in this type of study is the Lotka's law or Lotka's inverse-square law, focused on the analysis of the scientific productivity of authors in different areas of knowledge (Machado Jr., Souza, Parisotto, & Palmisano, 2016).

Lotka (1926) looked for to estimate the volume of the scientific production of the authors present in the Chemical Abstracts in a temporal snip of seven years - 1909 to 1916. In conclusion, the study pointed out that much of the scientific production in a certain area of knowledge is the result of the work of a select group of researchers, while a larger group contributes little to the development of science. In terms of volume of production, the small group of authors is equal to the performance of the many authors who present low productivity (Araujo, 2006).

Research that presents results to support the management of institutions, assisting in sustainability, as well as at improving internal processes aimed at are of great importance. Thus, this article aims to identify the profile and degree of productivity of researchers in University Management, seeking to highlight who are the researchers that discuss this issue in Latin America and to determine if there is adherence between their respective areas of training and/or qualification and the managerial aspects of complex institutions, such as Universities, University Centers and Colleges.

## 2. Methodology

This study is based on the foundations of the bibliometry. The defined methodological steps sought to be compatible with the objective of identifying the professional profile and the degree of productivity of the researchers on the University Management. For this, five main stages were developed: definition of the periodical for the collection of articles; selection of papers on the theme of research interest; search of the professional curriculum in the Lattes Platform of all selected authors; elaboration of spreadsheets for data recording and application of the principles of Lotka's Law and of the adjustment of the Inverse-Square proposed by Price

Among the journals that approach the theme of University Management, the University Management Journal in Latin America (GUAL) was chosen because of its comprehensiveness, focus and scope. The GUAL Journal aims to promote research and discussions on issues related to University Management and Higher Education in Latin America; publishes four annual editions, with fifteen articles each, totaling an amount of sixty articles per year. Their publications are indexed in Network of Scientific Journals of Latin America and the Caribbean, Spain and Portugal (REDALYC); Regional Information System Online for Scientific Journals from Latin America, the Caribbean, Spain and Portugal (LATINDEX); Directory of Open Access Journals (DOAJ); and Portal of Journals of the Federal University of Santa Catarina (GUAL, 2017).

After the identification of the journal, the selection criteria of the articles were defined. It was decided by a temporal snip of five years, collecting articles published between the years of 2012 and the first semester of 2017. were selected articles that presented in the title, abstract or keywords at least one of the following expressions: University Management; Management of Higher Education Institutions; Strategy; Strategic Management; Strategic Planning; Management Model; Institutional Development Plan, Competitive Advantage. The search also included articles written in the Spanish language.

After the selection of the articles, a search was made on the Lattes Platform of the National Council for Scientific and Technological Development (CNPq). The objective of this search was to obtain information about the professional profile of all the authors that published in the journal GUAL, in the temporal snip defined by the research. In this phase, was elaborated a structured script in Microsoft Excel (2016) contemplating twelve categories: year of publication; names of authors; authors' order (1st, 2nd ... 6th author); genre of the first author; area / training of authors; titration of the authors; institution to which the author is bound / affiliation; academic organization of the institution (Faculty, University Center or University); administrative category of the institution (public, private); current employment or institutional link of the author; position currently busy; and additional information (other information not included in the previous categories).

Finally, the principles of the Lotka's law, known as of the Lotka's inverse-square law ( $1/n^2$ ) were applied, as well as the adjustment of the Inverse-Square ( $1/n^3$ ) proposed by Price. The objective of this stage was to identify the degree of productivity of the authors and to verify if the productivity in the area of University Management if approaches the conclusions pointed out in the studies of Lotka or the of Price. This methodological step was realized with based on the study developed by Oliveira (1983), who calculated the productivity of the authors on the Jaca fruit, applying the principles of the Lotka's law ( $1/n^2$ ), as well as the adjustment of this law proposed by Price ( $1/n^3$ ).

According to Urbizagastegui (2008, p.89) "the number of authors who make  $n$  contributions in a given scientific field is approximately  $1/n^2$  of those who make a single contribution." Thus, mathematically representing the Lotka's law, it could be presented as:

$$L_n = \frac{1}{n^2} p$$

$L_n$  = number of authors who make " $n$ " contributions;

$n^2$  = square of the amount of contributions researched;

$p$  = number of authors who published only one article.

In the adjustment proposed by Price, the mathematical equation assumes a configuration similar to that of Lotka, modifying only the exponent applied to " $n$ ". Thus:



$$P_n = \frac{1}{n^3} p$$

$P_n$  = number of authors who make "n" contributions;  
 $n^3$  = cube of the amount of contributions researched;  
 $p$  = number of authors who published only one article.

In this step, a spreadsheet was elaborated with the names of the first authors of the articles selected and applied the mathematical formulas of Lotka and Price. Subsequently, Table 1 was elaborated, with seven categories: number of articles (x); number of first authors (y); percentage of authors; total articles (x.y); percentage of articles; results obtained from Lotka's Law; results obtained from the Price adjustment.

### 3. Analysis and Discussion of Results

Considering the temporal snip and the search criteria, were identified 73 articles on University Management in the GUAL Journal. In absolute terms, 2013 was the year in which the journal had the highest concentration in the area studied (18 papers), registering a growth of 20% in relation to the previous year, when it published fifteen articles. In the following two years, the occurrence of articles on University Management fell to ten, in 2014, and to eight in 2015, being resumed in 2016, when the journal presented fourteen works in the area. In 2017, it was only possible to determine the publications of the first semester, totaling eight in total.

With the aim of to identify the researchers involved in this production, to later describe the professional profile and calculate the degree of productivity, it was possible to determine a quantitative of 245 authors and / or co-authors related to the 73 selected articles, linked to 63 different HEIs. However, this number represents a gross quantity since it was noted that the database included the names of authors who had participated in the preparation of more than one article, being your name counted more than once. This observation is important to avoid "contamination" of the actual quantity of different identified authors, although it does not invalidate its use in analyzes that require the gross quantitative, such as the number of authors and co-authors, for example, demonstrated in Figure 1.

Analyzing the database in detail, it was noticed that of the universe of 245 authors and / or co-authors, 18 of them were involved in the production of 43 articles. The distribution of the authors by article occurred as follows: thirteen participated in the preparation of two articles (resulting in 13 duplications); three authors of three articles (6 duplicities); and two authors of four articles (6 duplicities), that is, the net quantity of authors and / or co-authors will be obtained by subtracting the number of duplicities (25) from the gross amount (245), resulting in 220 authors and / or co-authors responsible for the production of the 73 articles.

After identifying the net quantitative of authors and / or co-authors (220), two types of analysis will be presented: one about the professional profile and the number of authors and / or co-authors involved in the production of the 73 articles selected and the other about the authors' productivity.

### 3.1 Professional profile of authors

The first variable analyzed was the number of authors per article (Figure 1). In this first analysis, it was sought to identify if the research in university management is being developed by multiple authorships or by unique authorships. For this, 245 was the gross amount of authors considered, a criterion that allowed to demonstrate the set of productions made by authors who participated in only one article, such as those who participated in more than one publication.

After analyzing the database, it was noticed that 93.2% of the scientific production of the area is being developed in partnership between two or more authors, as shown in Figure 1.

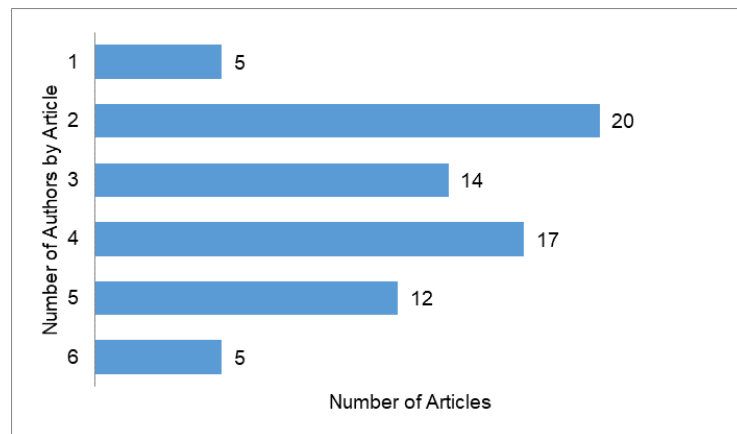


Figure 1: Number of authors by article

Source: Research Data

In addition to highlighting the supremacy of co-authoring work, the Figure 1 shows the predominance of articles developed in pairs (27.4%) or groups of three to five authors (58.9%), whose percentages, added represent 86.3% of production. Authors who developed individual researches or with groups of six coauthors, represented 6.8% each.

The confirmation that a large part of the scientific production of an area is developed by multiple authorship (coauthorship) was also evidenced in the work of Cernelós, Maingué, and Galdamez (2016). The researchers verified that the work produced in annals of Brazilian congresses and periodicals in the area of Accounting about Environmental Performance indicators has been elaborated jointly by three or more authors (74%). Disagreeing with the findings, Leite Filho (2008) verified that there is a predominance of single authorship in journals and that, normally, the higher averages of authors per article are found in annals of congresses.

Outlining the profile of the researchers regarding gender and considering only the first author of each article, there was a predominance of male authors, 58.0%, a difference of 16 percentage points in relation to the participation of the female gender in the development of research in university management, as shown in Figure 2.



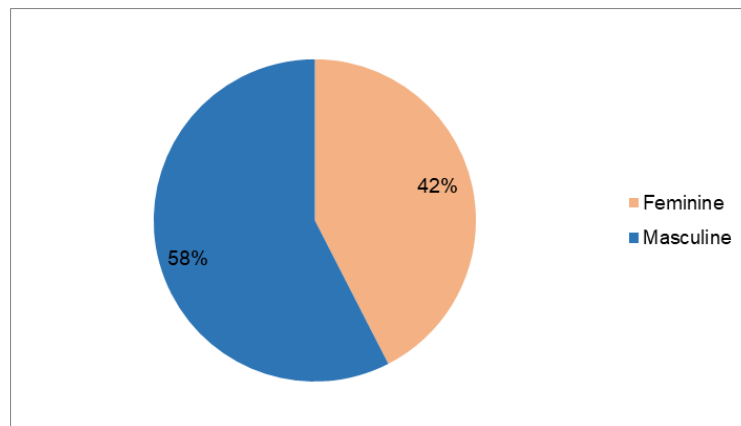


Figure 2 - Genre of the first author

Source: Research Data

Another interpretation that can be drawn from this percentage is that the participation of the female gender in the studied journal (42.0%) was more significant than those observed in other studies, such as those performed by Oliveira et al. (2011), who studied the profile and the scientific production of researchers linked to CNPq and in cardiology, and Mazzon and Costa Hernandez (2013) who researched Brazilian scientific production in marketing in the period 2000-2009. Oliveira, Ribeiro, Quirino, Oliveira, Martelli, Lima, Colosimo, Lopes, Silva, and Martelli-Jr (2011) verified that 72% of the researches in cardiology were produced by male researchers, a fact corroborated by Mazzon and Costa Hernandez (2013), who noticed the predominance of the male gender (66%) in the marketing area, however, highlighted a trend of increasing feminine participation in the scientific production of the area.

To report the percentages related to the academic qualification of the researchers, the net quantitative of authors was considered (220), disregarding the 25 authors and / or repeated co-authorship. The figure 3 shows that the doctoral (50.5%) and the master's degree (31.4%), together, represented 81.9% of the degree of authors and / or co-authors who published in the GUAL Journal between 2012 and the first semester of 2017. In addition, it was observed that, in the universe of articles selected, all had at least one author with doctorate. This was the title of the first author of approximately 43.0% of publications.

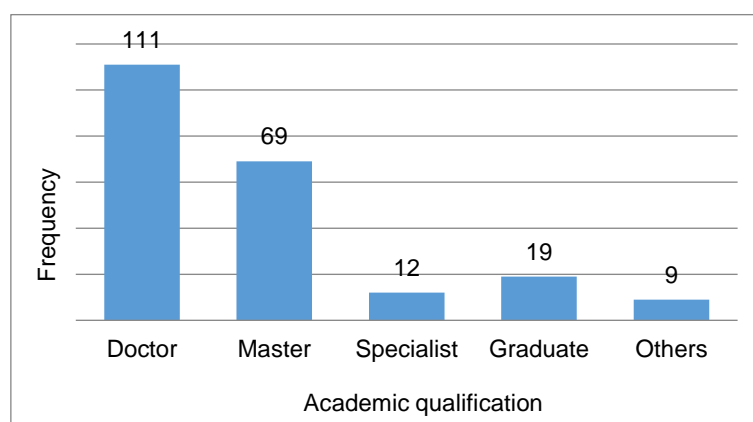


Figure 3: Authors' academic qualification

Source: Research Data

The studied universe also showed an evident dynamics in relation to the elevation of the titration of the authors. Of those who completed the master's degree in the year they published the article in the GUAL Journal, approximately 25.0% of them completed their doctorate at the date of analysis of the data of this research and 44.0% were in the process of doctorate. Among the authors with a doctorate, approximately 25.0% had already completed their postdoctoral training.

The wide participation of researchers with doctorate in the development of scientific research was observed in studies of different areas of knowledge. Perdigão, Niyama, and Santana (2010), who sought to analyze the characteristics and trajectory of the Accounting, Management and Governance Journal, in the period 1998-2009 highlighted, among other aspects, the concentration of doctors and masters, 43% and 24% respectively, among the authors who published in the journal. Rocha, Nagliate, Furlan, Rocha, Trevisan, and Mendes (2012) identified that 65% of the researchers who published on health knowledge management, whether in national journals or international journals, have a doctorate degree. Vieira Zanella, Groff, Oliveira, Kemp de Matos, Rocha Furtado, and De Assis (2013), when investigating the academic production between 2002 and 2011 on youth and public policies, published in Brazilian scientific journals that integrate the SCIELO database, observed the predominance of doctors among the authors, 60 % of total.

Analyzing the concentration areas of the authors' graduate programs (Figure 3), it was possible to determine that approximately 31.5% and 65.2% of the researchers with doctoral or master's degrees are, respectively, doctors and masters in administration. Furthermore, among the researchers who completed the master's or doctoral course after publication in the GUAL Journal, 69.0% did so in administration and 58.0% of those who had not yet completed their postgraduate, are enrolled in programs the same area of concentration.

Another relevant fact about the profile of the researchers in University Management is that, although they present training in different areas of knowledge, especially in the human sciences and applied social sciences, information collected in the CNPq platform, available in each author's Curriculum Lattes, indicate that 50.0% of them (110) have completed higher education in Business Administration, 10% in Accounting Sciences, 5.9% in Psychology, 5.4% in Economic Sciences and 5.0% in Pedagogy. The percentage corresponding to 16.4% refers to the authors who inform have formed in other areas, such as Social Sciences, Licenciatures, Law and Engineering; and 7.3% refers to authors who did not provide this information in their professional curriculum.

These percentages, added to those related to the concentration area of postgraduate programs, show that the research on the management of HEIs is being carried out by researchers who have knowledge about administrative and managerial processes, organizational environments and tools to support the strategic management of institutions.

Regarding the academic link of the 220 authors (Figure 4), it was verified that 97.2% of them are linked to universities. Of this universe, 68.2% have ties with public universities, 29.0% with public and private non-profit universities (community) and 2.8% with private for-profit universities.

As for the academic organization, the greater participation of the Universities in the scientific production on University Management was an expected reality. Its responsibilities in the processes of development of research and dissemination of knowledge are foreseen in article 207 of the Federal Constitution of 1988,

by the principle of inseparability between teaching, research and extension (Brasil, 1988). However, although expected, the broad participation of the universities verified in Figure 4 is something that stands out. Only 1.7% and 1.3% of the universe of authors studied declared to be linked to University Centers or Faculties, respectively.

This reference is symmetrical in the observations of Chiarini and Vieira (2012) in explaining that the Public Universities are, in fact, the HEIs that most support the development of research in Brazil, contributing to the processes of creation and dissemination of new knowledge and new technologies, through basic and applied research.

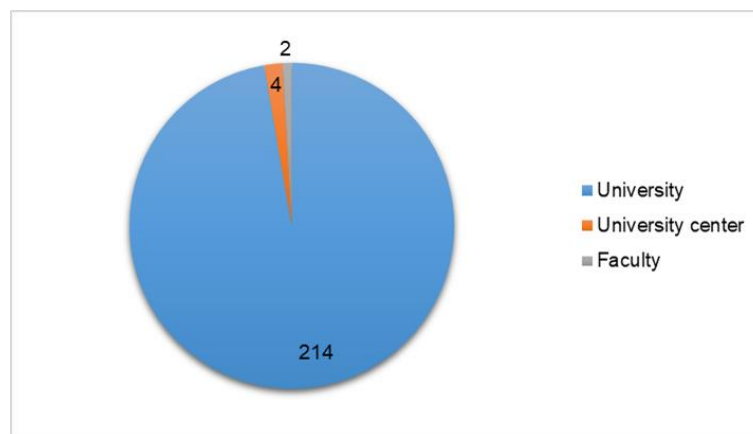


Figure 4: HEIs Academic Organization

Source: Research Data

After identifying the broad participation of the universities in the scientific production on University Management, HEIs were classified based on the frequency with which they appeared in the database prepared for this work, according to the declaration of the link of each author. For that, the gross quantitative of authors (245 authors and / or co-authors) was considered, since the objective was to understand which were the most representative institutions in the production of research and diffusion of knowledge on the subject. 63 different HEIs were identified, among Universities, University Centers and Colleges. It was decided to list the HEIs that appeared at least five times in the database, as shown in Figure 5.

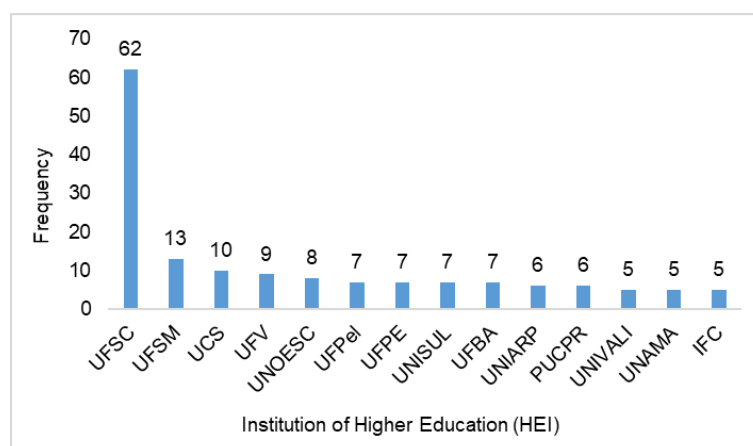


Figure 5: Academic affiliation of the authors (ranking of the universities that most appeared)

Source: Research Data

Figure 5 shows the 14 HEI (22.2%) identified as the most representative of the authors and / or co-authors according to the criteria defined by this study. The links of these HEIs with the total number of researchers considered (245) registered the percentage of 64.1%, that is, 157 researchers. The remaining HEIs, 49 (77.8%) were cited between four and one time by 88 authors (35.9%).

It is still possible to notice in Figure 5 that the Federal University of Santa Catarina (UFSC) was the HEI that most presented a link with the authors who published in the Journal GUAL during the period studied: 62 researchers (25.3%) signed the authorship and / or co-authorship of 21 articles (28.8%). These percentages indicate signs of endogeneity in the GUAL Journal. According to Valerio (1994), endogeneity occurs when the main holder of scientific authorship and production is the journal institution itself. These signs of endogeneity, perceived in the Journal GUAL can be understood as a reflection of the scientific productions developed by the professors and students of the Professional Master's in University Administration, as well as the researchers of the Institute of Researches and Studies in University Administration (INPEAU), both linked to UFSC.

It is worth mentioning that endogeneity may appear in different percentages in scientific journals. Researching the Accounting and Finance Journal of the University of São Paulo (USP), Leite Filho (2008) found that approximately 74% of the publications had authors related to the institution. In relation to the Journal Unb Contábil, this percentage was 43%.

Another variable analyzed to compose the authors' professional profile was the role they play in their respective institutions (Figure 6). For this, analyzed the Lattes Curricula of 220 authors (net quantitative). Among the researchers it was possible to locate scholarship students, undergraduate and graduate students, professors and coordinators of Stricto Sensu graduate programs, occupiers of trust functions and positions in commission. In general, it was observed that the authors perform functions that are closely related to teaching and research activities in institutions, highlighting the importance of articulation between the two areas in the production, discussion and diffusion of knowledge.

Of the universe studied, approximately 53.2% have more than one function. Of the total of 220 authors, 146 are teachers, equivalent to 66.3% of this total. Figure 6 shows the different functional situations of the authors in relation to the origin HEI. Two phenomena are worth mentioning: the different functional conditions that the teacher assumes and the expressive percentage in which the functions were not identified or were identified as "Other", approximately 19.5%. This percentage represents the authors who did not report their role in their respective institutions, as well as authors who perform administrative functions, functions of trust and / or positions in commission, such as administrative assistants, analysts, administrators, accountants, directors and pro-rectors.

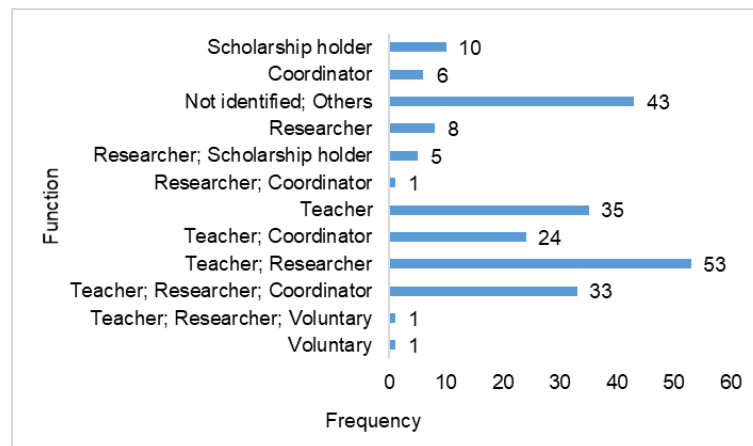


Figure 6 - Role occupied by authors in HEIs

Source: Research Data

The data presented in Figure 6 show that University Management is being considered and discussed by the various Stakeholders of HEIs. These data reflect the interrelationship and cooperation between several categories in the search for new knowledge that can aid in the administration and sustainability of the institutions.

### 3.1 Author's Productivity

In quantitative terms, what Lotka's Law establishes is that authors' productivity represents a proportion of the authors who contributed only one publication of a studied universe, corresponding to the inverse of the "n" square. Thus, "n" represents the number of publications to be searched (Machado Jr., Souza, Parisotto, & Palmisano, 2016).

In his study, Lotka (1926) considered only the first author of each article, ignoring the other authors who contributed in articles of multiple authorship. In applying the of the inverse-square law, Lotka noted that for every 100 authors who write only one article, 25 will contribute only two ( $n = 2$ ;  $100 / n^2 = 25$ ); approximately eleven will participate with three articles each ( $n = 3$ ;  $100 / n^2 = 11$ ); about six authors will cooperate with four articles each ( $n = 4$ ;  $100 / n^2 = 6$ ); so that the number of authors with "n" contributions is  $1 / n^2$  of the number of those who contribute only one article (Oliveira, 1983).

Lotka's Law seeks to measure authors' productivity through a size-frequency distribution model in a set of documents (Vanti, 2002). However, since its formulation in 1926, several studies have been developed in an attempt to propose alternatives to the model which fit better the data set observed, as well as its area of concentration (Alvarado, 2002; Urbizagastegui, 2008). One of these studies was developed by Price, who adjusted the Lotka equation ( $1/n^2$ ) to  $1/n^3$  (Braga, 1974).

Table 1, which shows the degree of productivity of authors in the area of University Management, as pointed out in the methodology, was elaborated based on the study developed by Oliveira (1983). In this stage of the research, sought to identify the first authors of the selected articles, as well the number of times these authors appeared in the first author's condition. For this, the spreadsheet with the information of the 73 articles was analyzed.

It was noticed that the authors published between 1 and 3 articles in the condition of first author. In absolute

numbers, it was found that 66 authors published 1 article (reference value to the application of Lotka's Law and the adjustment proposed by Price); 2 authors published 2 articles (total of 4 articles); and 1 author published 3 articles (total of 3 articles), totaling 73 articles, as demonstrate in Table 1. Among the authors, none contributed with more than 3 articles, in the condition of first author.

Table 1: Number of authors in relation to the number of articles published on University Management in the GUAL Journal between 2012 and 2017.

<b>Number of articles (x)</b>	<b>Number of first authors (y)</b>	<b>Authors (%)</b>	<b>Total articles (x . y)</b>	<b>Articles (%)</b>	<b>Lotka's Law</b>	<b>Adjustment proposed by Price</b>
<b>1</b>	66	95,7%	66	90,4%	-	-
<b>2</b>	2	2,9%	4	5,5%	16,5	8,2
<b>3</b>	1	1,4%	3	4,1%	7,3	2,4
<b>TOTAL</b>	69	100,0%	73	100,0%		

Source: Research Data

Considering the method of counting authorship proposed by Lotka - first author only - (Urbizagastegui, 2008) and observing the data presented in Table 1, it can be seen that 90.4% of the total articles selected (73 articles) were written by the 66 authors who wrote a single article, in the condition of first author. This means that 95.7% of the authors (66 authors) contributed only one work on University Management in the period studied, 5.5% published two articles and 4.1% three articles<sup>1</sup>.

One of the conclusions pointed out by Lotka is that the approximate proportion of authors who will contribute only one article to the theoretical production of a given theme is approximately 60% (Alvarado, 2002). It is noticed that in the scientific production in University Management the presence of authors with only one article (95.7%) was significantly higher than the percentage suggested by Lotka.

Continuing the authors' productivity analysis from the application of Lotka's Law, it was found that the percentages relative to the authors who published two or three articles also showed a considerable distance from the standards established by the law. While the ideal value for authors who publish two and three articles would be 16.5 and 7.3, respectively, the actual numbers verified showed that only two authors (2.9%) published two papers and one author (1.4%) contributed three articles.

Number of authors who, according to the Law of Lotka, would contribute to the area of University Management

$$L_n = \frac{1}{n^2} p$$

Contribution with two articles

$$L_2 = \frac{1}{2^2} 66 \Rightarrow L_2 = 16,5$$

Contribution with three articles

$$L_3 = \frac{1}{3^2} 66 \Rightarrow L_3 = 7,3$$

Number of authors who, according to Price's adjustment, would contribute to the area of University Management

$$P_n = \frac{1}{n^3} p$$

Contribution with two articles

$$P_2 = \frac{1}{2^3} 66 \Rightarrow P_2 = 8,2$$

Contribution with three articles

$$P_3 = \frac{1}{3^3} 66 \Rightarrow P_3 = 2,4$$

Still on the productivity of the authors, it was noticed that the literature on University Management presents values distant, also, of the standards pointed out by Price. Following the logic defended by Price, 8.2 and 2.4 authors would publish two and three articles, in that order. However, the proportions verified by the survey indicate that only two authors published two papers, and one author published three.

According to Price's observations, approximately 33% of the scientific publications (1/3) ends up being produced by 10% (1/10) of the most productive authors - on average, this productivity revolves around 3.5 publications per author (Braga, 1974). Considering that the most productive authors of the researched literature are those who wrote between 2 and 4 articles and that this production resulted in 43 publications, it could be concluded that the average production of this group was 2.4 publications by author.

Differently from the literature about Jaca studied by Oliveira (1983), which adjusted to the productivity standards suggested by Price, the productivity of the authors on University Management presented results different from those suggested by Price and Lotka. However, they are closer to the expected results by the adjustment proposed by Price, especially if compared to the values achieved with Lotka's Law.

On the discordance between the numbers expected from the application of the Lotka's Law and the real productivity of the authors in several areas of knowledge, what is perceived is that the results when confronted, sometimes reinforce the validity of the Law, sometimes invalidate, either in relation to its comprehensiveness or in relation to its applicability. Most of the time, they are contradictory, conflicting and inconclusive (Alvarado, 2002; Urbizagastegui, 2008).

As with the literature on University Management, others also did not conform to the productivity standards suggested by Lotka, such as the literature on Jaca (Oliveira, 1983); on information management (Rossoni & Hocayen-da-Silva, 2009); in the area of managerial accounting in hospitals (Zanievicz da Silva & Beuren, 2015); and strategic cost management (Voese & Mello, 2013). All of them presented percentages below the standards established by the law.

On the other hand, the study by Souza and Ribeiro (2013) in management journals in the area of environmental sustainability showed partial adherence to Lotka's Law. Researching in the area of



accounting, Leite Filho (2008) suggested that the total number of authors of the congresses and journals researched, could have a productivity statistically equal to the standards described by Lotka's Law.

#### 4. Final considerations

In this study, were identified the profile and degree of productivity of researchers in University Management. The results of the research revealed a high collaboration among the authors in the development of studies in the area. There is predominance of the masculine gender in the scientific production on University Management and supremacy of teachers among the researchers.

The results also showed that a significant number of authors have master's degree or doctorate degrees and management knowledge, since many of them are graduates or post-graduates in management. In addition, it is possible to affirm that the Universities are in the vanguard of the development of researches in University Management and there are signs of the existence of an elite of researchers on the theme.

It was verified that many of the authors surveyed contributed with few studies in the area and that the degree of productivity of these authors presented values below the standards predicted by the Lotka's law, as well as by the adjustment proposed by Price.

In sum, the results evidence out that the researchers on University Management are qualified and have technical and / or scientific knowledge about the management of complex institutions. Thus, these researchers can contribute with the development of management models or management support tools which may be applied in HEIs. The practical application of these results may promote the improvement of the management processes, the efficiency in the service supply, as well as the sustainable development of the institutions.

It is suggested, for future studies, the analysis of a larger number of journals and a temporal snip broader. This will make it possible to broaden the results and apply the principles of Lotka's Law and the adjustment suggested by Price on a broader basis.

#### References

- Almeida de Carvalho, C. H. (2007). Estudo comparado sobre a expansão do ensino superior: Brasil e Estados Unidos. En publicacion: Escenarios mundiales de la educación superior. Análisis global y estudios de casos. López Segrera, Francisco. CLACSO, *Consejo Latinoamericano de Ciencias Sociales*. <http://bibliotecavirtual.clacso.org.ar/ar/libros/campus/segrera/06AdeCarvalho.pdf>
- Alvarado, R. U. (2002). A Lei de Lotka na bibliometria brasileira. *Ciência da Informação*, 31(2), 14-20. <http://revista.ibict.br/ciinf/article/view/956>
- Araujo, C. A. (2006). Bibliometria: evolução histórica e questões atuais. *Em Questão*, 12(1), 11-32. <http://seer.ufrgs.br/index.php/EmQuestao/article/view/16>
- Braga, G. M. (1974). Informação, Ciência, Política Científica: O Pensamento de Derek de Solla Price. *Ciência da Informação*, 3(2), 155-177. <http://revista.ibict.br/index.php/ciinf/article/view/50>
- Brasil. (1988). Constituição da República Federativa do Brasil. *Senado Federal*. [https://www.senado.gov.br/atividade/const/con1988/CON1988\\_05.10.1988/ind.asp](https://www.senado.gov.br/atividade/const/con1988/CON1988_05.10.1988/ind.asp)

Brasil. (2006). Decreto nº 5773, de 9 de maio de 2006. Dispõe sobre o exercício das funções de regulação, supervisão e avaliação de instituições de educação superior e cursos superiores de graduação e sequenciais no sistema federal de ensino. *Diário Oficial da União*, Seção 1, 6-10.

[http://www.planalto.gov.br/ccivil\\_03/\\_ato2004-2006/2006/decreto/d5773.htm](http://www.planalto.gov.br/ccivil_03/_ato2004-2006/2006/decreto/d5773.htm)

Carnelós, D. F. S., Maingué, E. M., & Galdamez, E. V. C. (2016). Indicadores de desempenho ambiental: um estudo bibliométrico das pesquisas científicas da área de ciências contábeis no período de 2010 a 2016. *RIC - Revista de Informação Contábil*, 10(3), 35-46.

<https://www.periodicos.ufpe.br/revistas/ricontabeis/article/download/22602/19238>

Carvalho, H. A. C. (2013). A mercantilização da educação superior brasileira e as estratégias de mercado das instituições lucrativas. *Revista Brasileira de Educação*, 18(54),

<https://www.scielo.br/pdf/rbedu/v18n54/13.pdf>

Chiarini, T., & Vieira, K. P. (2012). Universidades como produtoras de conhecimento para o desenvolvimento econômico: sistema superior de ensino e as políticas de CT&I. *Revista Brasileira de Economia*, 66(1), 117-132. [https://www.scielo.br/scielo.php?script=sci\\_arttext&pid=S0034-](https://www.scielo.br/scielo.php?script=sci_arttext&pid=S0034-71402012000100006)

[71402012000100006](https://www.scielo.br/scielo.php?script=sci_arttext&pid=S0034-71402012000100006)

Leite Filho, G. A. (2008). Padrões de Produtividade de Autores em Periódicos e Congressos na Área de Contabilidade no Brasil: um Estudo Bibliométrico. *Revista Brasileira Contemporânea*, 12(2), 533-554.

[https://www.anpad.org.br/periodicos/arq\\_pdf/a\\_751.pdf](https://www.anpad.org.br/periodicos/arq_pdf/a_751.pdf)

Lotka, A. J. (1926). The frequency distribution of scientific productivity. *Journal of the Washington Academy of Sciences*, 16(12), 317-323.

[https://www.jstor.org/stable/24529203?seq=1#page\\_scan\\_tab\\_contents](https://www.jstor.org/stable/24529203?seq=1#page_scan_tab_contents)

Machado Jr, C., Souza, M. T.S., Parisotto, I. R. S., & Palmisano, A. (2016). As leis da bibliometria em diferentes bases de dados científicos. *Revista de Ciências da Administração*, 18(44), 111-123.

<https://www.redalyc.org/html/2735/273545375009/>

Martins, C. B. (2009). A reforma universitária de 1968 e a abertura para o ensino superior privado no Brasil. *Educação & Sociedade*, 30(106), 15-35

[https://www.scielo.br/scielo.php?script=sci\\_arttext&pid=S0101-73302009000100002](https://www.scielo.br/scielo.php?script=sci_arttext&pid=S0101-73302009000100002)

Mazzon, J. A., & Da Costa Hernandez, J. M. (2013). Produção científica brasileira em marketing no período 2000-2009. *RAE - Revista de Administração de Empresas*, 53(1), 67-80.

[https://www.rae.fgv.br/sites/rae.fgv.br/files/artigos/10.1590\\_0034-7590201300100007\\_0.pdf](https://www.rae.fgv.br/sites/rae.fgv.br/files/artigos/10.1590_0034-7590201300100007_0.pdf)

Medeiros, J. M. G. & Vitoriano, M. A. V. (2015). A evolução da bibliometria e sua interdisciplinaridade na produção científica brasileira. *Revista Digital de Biblioteconomia e Ciência da Informação*, 13(3), 491-503.

<https://www.periodicos.sbu.unicamp.br/ojs/index.php/rdbci/article/view/8635791/8382>

Meyer Jr, V., Pascucci, L., & Mangolin, L. (2012). Gestão estratégica: um exame de práticas em universidades privadas. *RAP-Revista de Administração Pública*, 46(1), 49-70.

<https://www.redalyc.org/html/2410/241021977004/>

Mueller, S. P. M. (2013). Estudos métricos da informação em ciência e tecnologia no Brasil realizados sobre a unidade de análise artigos de periódicos. *Liinc em Revista*, 9(1), 627.

<https://www.repositorio.unb.br/handle/10482/16129>

Oliveira, E. A., Ribeiro, A. L. P., Quirino, I. G., Oliveira, M. C. L., Martelli, D.R., Lima, L.S., Colosimo, E. A., Lopes, T. J., Silva, A. C. S., & Martelli-Junior, H. (2011). Profile and Scientific Production of CNPq Researchers in Cardiology. *Arq Bras Cardiol*, 97(3), 186-193.

[https://www.scielo.br/scielo.php?pid=S0066-782X2011001200002&script=sci\\_arttext](https://www.scielo.br/scielo.php?pid=S0066-782X2011001200002&script=sci_arttext)

Oliveira, S. M. (1983). Aplicação da lei de produtividade de autores de Lotka a literatura de jaca. *Revista Biblioteconomia, Brasília*, 11(1), 125-130.

[https://www.brapci.ufpr.br/brapci/\\_repositorio/2011/06/pdf\\_71c1d2ca3b\\_0017066.pdf](https://www.brapci.ufpr.br/brapci/_repositorio/2011/06/pdf_71c1d2ca3b_0017066.pdf)

Perdigão, L. Z., Niyama, J. K., & Santana, C. M. (2010). Contabilidade, Gestão e Governança: análise de doze anos de publicação (1998 a 2009). *Contabilidade, Gestão e Governança* 13(3), 3-16.

<https://www.repositorio.unb.br/handle/10482/14465>

Piñero, M. L., Bravo, M. L. S., & Carrillo, A. (2014). Gestión universitaria y funcionalidad de los portales virtuales. *Investigación y Postgrado*, 29(1), 151-181.

<https://www.redalyc.org/html/658/65848192007/>

Revista Gestão Universitária na América Latina [GUAL]. (2017). Sobre a revista. *GUAL - Revista Gestão Universitária na América Latina*, ISSN 1983-4535, Florianópolis, Santa Catarina, Brasil.

<https://www.periodicos.ufsc.br/index.php/gual/about>

Rocha, E. S. B., Nagliate, P., Furlan, C. E. B., Rocha, K., Trevisan, M. A., & Mendes, I. A. C. (2012). Gestión del conocimiento en salud: revisión sistemática de la literatura. *Revista Latino-Americana Enfermagem*, 20(2), 09.

<https://www.redalyc.org/html/2814/281422733024/>

Rossoni, L., & Hocayen-Da-Silva, A. J. (2009). Administração da informação: a produção científica brasileira entre 2001 e 2006. *REAd - Revista Eletrônica de Administração*, 15(2).

<https://www.redalyc.org/html/4011/401137513007/>

Souza, M. T.S., & Ribeiro, H. C.M. (2103). Sustentabilidade Ambiental: uma Meta-análise da Produção Brasileira em Periódicos de Administração. *Revista Brasileira de Economia*, 17(3), 368-396.

<https://www.scielo.br/pdf/rac/v17n3/a07v17n3>

Urbizagastegui, R. (2008). A produtividade dos autores sobre a Lei de Lotka. *Ciência da Informação*, 37(2), 87-102. <https://www.scielo.br/pdf/ci/v37n2/a07v37n2>

Valerio, P. M. (1994). *Espelho da ciência: avaliação do programa. Setorial de Publicações em Ciência e Tecnologia da FINEP* (160p). Rio de Janeiro: FINEP, IBICT.

Vanti, N. A. P. (2002). Da bibliometria à webometria: uma exploração conceitual dos mecanismos utilizados para medir o registro da informação e a difusão do conhecimento. *Ciência da Informação*, 31(2), 152-162.

<https://www.scielo.br/pdf/ci/v31n2/12918.pdf>

Vieira Zanella, A., Groff, A. R., Oliveira, D. B.S., Kemp De Mattos, L., Rocha Furtado, J., & De Assis, N. (2013). Jovens, juventude e políticas públicas: Produção acadêmica em periódicos científicos brasileiros (2002 a 2011). *Estudos de Psicologia*, 18(2), 327-333.

<https://www.redalyc.org/html/261/26128209019/>

Voese, S. B., & Mello, R. J. G. (2013). Análise bibliométrica sobre gestão estratégica de custos no Congresso Brasileiro de Custos: Aplicação da lei de Lotka. (*RCCe*) - *Revista Capital Científico - Eletrônica*, 11(1). <https://www.revistas.unicentro.br/index.php/capitalcientifico/article/view/1995>

Zanievicz Da Silva, M., & Beuren, I. M. (2015). Contabilidade gerencial em hospitais: análise bibliométrica de artigos publicados no período 1950 a 2011. *Revista Alcance*, 22(1), 80-104, 2015.

<https://www.redalyc.org/html/4777/477747166005/>

---

<sup>i</sup> Of the number of authors that participated in more than one research, approximately 55.5% reported being linked to the UFSC. This percentage reinforces the previous data that indicated signs of endogeny in the researched journal and indicates to the existence of an elite of researchers on University Management linked to this institution.