Revista de Educação e Pesquisa em Contabilidade
Journal of Education and Research in Accounting
Revista de Educación e Investigatión en Contabilidad

REPeC, Brasília, v. 6, n. 4, art. 4, p. 374-392, oct./dec. 2012
Available online at www.repec.org.br
ISSN 1981-8610

Academic Cooperation: Analysis of Publications on Accounting Teaching and Research in Scientific Events

Emerson Muniz Freitas
M.Sc. in Accountancy (UFPR)
Av. Prefeito Lothário Meissner, 632, Sala 120, Jardim Botânico, Curitiba (PR)
E-mail: emersonmfreitas@gmail.com

Vicente Pacheco
Ph.D. in Production Engineering (UFSC)
Associate Professor, Universidade Federal do Paraná (UFPR)
Av. Prefeito Lothário Meissner, 632, Sala 120, Jardim Botânico, Curitiba/PR
E-mail: vpacheco@ufpr.br

Regina Maria Karolkievicz
M.Sc. in Accountancy (UFPR)
Av. Prefeito Lothário Meissner, 632, Sala 120, Jardim Botânico, Curitiba/PR
E-mail: reginakarol@hotmail.com

Edson Paes Sillas
M.Sc. in Accountancy (UFPR)
Av. Prefeito Lothário Meissner, 632, Sala 120, Jardim Botânico, Curitiba/PR
E-mail: edsonsilas@yahoo.com.br

Abstract
Scientific knowledge is socially developed, based on the collaboration among the authors involved in the process. Departing from this premise, the aim in this study is to map, through the analysis of social networks, collaborative interactions in studies on Accounting Teaching and Research. Therefore, 215 articles were analyzed about the research theme, published in the proceedings of Enanpad, the USP Controllership and Accountancy Congress and Anpcont. The social network analysis method was used to develop the collaborative partnership structures in the study period, ranging from 1999 to 2009. In addition, we intended to check whether the researchers' centrality indicators are associated with their production, using Spearman's non-parametric t-test. Centrality identifies the most important authors in a social network in which, the more central, the more relevant these authors' contribution. At the end of the study, the most important researchers and higher education institutions for the area came out, in terms of the number of authorships as well as the intermediation these researchers and institutions provide. Among the researchers, Gilberto de Andrade Martins and Edgard Bruno Cornachione Jr. stood out, representing the most productive experts. Both are affiliated with

Published in Portuguese, English and Spanish. Original Version in Portuguese.

Received in 01/09/2010. Ask to Revise on 12/10/2011. Resubmitted on 23/01/2012. Accepted on 29/06/2012 by Valcemiro Nossa (Editor). Published on 30/11/2012. Organization responsible for the journal: CFC / FBC / ABRACICON.

Copyright © 2012 REPEC. All rights, even translation, are reserved. It is allowed to quote part of articles without prior permission if the source is identified.

the University of São Paulo, the Higher Education Institution (HEI) responsible for the highest number of authorships during the period. In addition, through the analysis of the association between the researchers' centrality indicators and scientific production volume, a significantly positive association was identified. Thus, it was verified that, the greater the intermediation and co-authorship relations with other experts, the more articles the authors under analysis publish.

Key Words: Social Networks; Co-authorship; Scientific knowledge; Teaching; Research

1. INTRODUCTION

According to Batistella, Bonacim and Martins (2008), the development of academic publications generally goes through three important phases: 1) discussions in research groups or at university; 2) presentations at scientific congresses; and, 3) publication in journals. Publishing the results found is important, as that is the way for researchers to report their conclusions to the academic community (BORBA and MURCIA, 2006). And bibliometrics research has gained strength, aimed at checking the profile in a given area, through the analysis of the papers researchers have developed (LYRIO, BORBA and COSTA, 2007).

In combination with the increasing attention paid to the design of published studies, different authors appoint the upward trend in the number of studies published in co-authorship (LABAND and TOLLISON, 2000; CRONIN, SHAW and LA BARRE, 2003; MOODY, 2004; ACEDO et al., 2006). According to Hudson (1996), producing studies in partnership provides a result that is qualitatively superior to isolated studies. Anyway, Guarido Filho, Machado-da-Silva and Gonçalves (2009) affirm that it is important to analyze existing social relations in this scientific interaction, in order to understand the roles of the actors who participate in the knowledge creation process.

In the light of these considerations, this study aims to map, through social network analysis, collaborative interactions in studies on Accounting Teaching and Research. In this research area, as demonstrated in Espejo et al. (2009), a great ascent has been observed in the number of articles, making it beneficial to investigate how this development is occurring.

Therefore, the papers published in the proceedings of three prominent accounting congresses: 1) National Encounter of the Association of Graduate Programs in Administration (Enanpad); 2) USP Controllership and Accountancy Congress; and, 3) Congresses of the National Association of Graduate Programs in Accountancy (AnpCont). The quantitative evolution in publications in the research area was investigated. Then, authors were classified according to their production volume and regularity. Finally, we aimed to evaluate whether the researchers and Higher Education Institutions' (HEI) centrality indicators were associated in their respective scientific production.

After this short introduction, the theoretical background is presented in section two. Then, the methodological procedures adopted to analyze the results are described. Finally, the conclusions are listed, as well as the observed limitations and suggestions for future research.

2. SOCIAL NETWORK APPROACH IN BIBLIOMETRIC RESEARCH

Social networks represent a set of anonymous actors who share resources, whether material or not, related to shared goals and interests (MARTELETO, 2001). This sociological research method has been one of the most used currents nowadays (ROSSONI and GUARIDO FILHO, 2007). It derives from sociometric studies by the Romanian psychiatrist Jacob Levy Moreno, and was further developed in North American sociology, turning into an important social research method (WELLMAN, 1988).

Rossoni, Hocayen-da-Silva and Ferreira Jr. (2008) affirm that studies using the social network approach aim to assess the structure of relations among their participants. According to Nelson (1984), the contacts connecting these actors may display distinct characteristics, different contents and particular structures. Through relationship patterns, their connection with the social structure is understood (EMIRBAYER and GOODWIN, 1994).

This research method has been frequently used in studies aimed at analyzing characteristics inherent in scientific publication. Scientific knowledge, according to Rossoni, Hocayen-da-Silva e Ferreira Jr. (2008, p. 1042, author's translation), "[...] is socially constructed, influenced by the peers who structurally make up the relationship network among institutions [...]." Therefore, cooperation among researchers should be encouraged (KATZ and MARTIN, 1997) due to the sharing of experiences and ideas among institutions (CRUZ, ESPEJO and GASSNER, 2009).

According to Hudson (1996), co-authorship can be defined as the involvement of two or more authors in the elaboration of a study. The author considers that its main advantage is the division of work, also permitting integration among researchers with different skills. Barnett, Ault and Kaserman (1998) add other advantages, including reduced time and improved quality of the article.

Different authors have verified the increase in collaboratively published articles (LABAND and TOLLISON, 2000; CRONIN, SHAW and LA BARRE, 2003; MOODY, 2004; ACEDO et al., 2006), a topic that has aroused academic interest (ESPARTEL, BASSO and RECH, 2008). Laband and Tollison (2000) elaborated a historical survey of publications in economic and biological areas. The authors analyzed the papers published in co-authorship between 1950 and 1995 and found an increase in the percentage of publications with more than one author in both research areas. In the economic area, the percentage grew from approximately 10% in 1950 to 70% in 1995; in biological research, this percentage increased from 30% to 80%.

Acedo et al. (2006) found that studies developed in this perspective follow two lines: 1) the first is aimed at identifying the reasons for and consequences of cooperation among researchers; and, 2) the second analyzes the social networks constituted through this interaction.

In the second research line Acedo et al. (2006) observed, which the present study fits into, the first research was developed by Newman (2001), focusing on natural sciences (GRAEML et al., 2008). This interest soon spread out across other knowledge areas though, including: physical sciences (BARABASI et al., 2002), digital research (LIU et al., 2005), sociology (MOODY, 2004), organizational studies and strategy (ACEDO et al., 2006; ROSSONI and MACHADO-SILVA, 2007; WALTER and SILVA, 2008); information management (GRAEML et al., 2008), public and social management (ROSSONI, HOCAYEN-DA-SILVA and FERREIRA Jr., 2008) and marketing (ESPARTEL, BASSO and RECH, 2008).

Different authors in Accountancy have also used the social network method to check how academic interaction has contributed to science. Wakefield (2008), for example, mapped the relation among journals, analyzing citations in the attempt to identify the most relevant Accountancy journals. This relevance was classified based on each journal's knowledge flow, considering not only direct citations, but also the indirect knowledge flow. This flow was mapped with the help of social network analysis and allowed the author to identify the *Journal of Accounting Research* (JAR) and *The Accounting Review* (TAR) as the most relevant publications.

Other studies can be cited to illustrate the use of the same method in scientific Accountancy research. Souza et al. (2008) analyzed the cooperation among HEI in Accounting papers presented at Enanpad, Anpcont, Enepq and the USP Controllership and Accountancy Congress. The authors concluded that HEI with graduate programs (academic Master's and Ph.D.) contribute to the development of Accountancy in Brazil with the largest number of publications, particularly the University of São Paulo (USP). The study results supported the findings by Leite Filho (2006), which link knowledge production in the area with graduate programs, as these are responsible for preparing researchers at Master's and Doctorate level.

Nascimento, Ribeiro and Junqueira (2008) focused on the behavioral approach in Management Accounting and observed that more than 80% of the authors identified in the research published only one paper in the area. The authors referred to Lotka's Law to explain this phenomenon. This law is based on the fundamental premise that "some researchers publish more and many publish less." (VOOS, 1974, author's translation). A similar result was found in Machado, Nascimento and Murcia (2009) who, in turn, focused on Social and Environmental Accounting studies. In that study, the authors identified that 77% of the authors published only one paper.

Despite the numerous studies developed to check academic cooperation characteristics in accounting research, none of them specifically focused on Accounting Teaching and Research papers. Next, the adopted methodological procedures will be presented, followed by the empirical results found.

3. METHODOLOGICAL PROCEDURES

In the first place, this study is descriptive as, based on the analysis of co-authorship networks, the aim is to characterize scientific production in Accounting Teaching and Research. Second, the study is also exploratory, as it investigates the existing association between the authors' centrality indicators and scientific production.

Documentary research was used as a data collection strategy. The investigated papers were obtained from the proceeding of the National Encounter of the Association of Graduate Programs in Administration (Enanpad), between 1999 and 2009; from the proceedings of the USP Controllership and Accountancy Congress, between 2001 and 2009; and from the proceedings of the past three Congresses of the National Association of Graduate Programs in Accountancy (AnpCont), held in 2007, 2008 and 2009.

The papers were collected in the respective events' different thematic areas and, hence, the search was not restricted to the specific Teaching and Research area. First, we read the abstracts of the papers presented in the congress proceedings. This first analysis permitted the selection of those texts that demanded a complete analysis in order to define their use in the research. After this initial analysis, two of the present research authors fully analyzed the papers selected based on the abstract. In case of diverging opinions, a third researcher read the paper to decide whether the text discussed Accounting Teaching and Research or not. At the end, the search resulted in 215 articles.

The information provided in the papers was considered to collect data on the authors' institutional affiliation. When this information was omitted, each author's Lattes curriculum was used to assess what institution the author was affiliated with when the study was published. Data on the event where the paper had been presented, authors, year and HEI of affiliation were included in an electronic file.

In this study, social network analysis was used to reach the intended research objective. According to Rossoni and Guarido Filho (2007), there are different possibilities to conduct network analysis, including many measures to evaluate characteristics inherent in existing relations. The co-authorship networks and their analyses were developed with the help of Ucinet 6.275 and Pajek 1.02. software. In this study, two sets of measures will be focused on: **centrality** and **cohesion**.

Centrality identifies the most important actors in a social network, in which, the more central, the more relevant these authors' contribution will be. For the sake of this evaluation, three measures are used (WASSERMAN and FAUST, 1994; SCOTT, 2000; HANNEMAN and RIDDLE, 2005): 1) degree centrality; 2) closeness centrality; and, 3) betweenness centrality.

Degree centrality is used to assess the authors locally, through the number of adjacent links between the individual and others in a network (WASSERMAN and FAUST, 1994). Hence, it demonstrates directly related elements.

In closeness centrality, not only direct relationships are evaluated. In addition, the concept of indirect relations is covered. This measure is defined by the function of the author's greater closeness with all others in the network. An actor with a higher closeness centrality level is in better conditions to rapidly interact with all others (WASSERMAN and FAUST, 1994; SCOTT, 2000; HANNEMAN and RIDDLE, 2005).

Betweenness centrality, then, measures an individual's ability to interconnect two other non-adjacent actors. Thus, the latter two depend on the first element (FREEMAN, 1979). Hence, the higher the degree of centrality, the greater an actor's potential control on the others who depend on him/her to interact (ROSSONI and GUARIDO FILHO, 2007).

Differently from centrality, in which the analysis is focused on the participating actors, in cohesion measures, the focus rests on the sub-networks that are constituted. Cohesive subgroups present relatively strong, direct and frequent links (WASSERMAN and FAUST, 1994). Scott (2000) argues that strong cohesion allows the subgroup to have its own standards, values and orientations.

Two measures are most frequently used for this evaluation (WASSERMAN and FAUST, 1994): 1) mutuality of links (clique); and, 2) closeness and reach among the subgroups' members (n-clique). Mutuality identifies to what extent subgroup actors' choices are mutual, in which clique represents a sub-network of three or more individuals who are totally interconnected (WASSERMAN and FAUST, 1994; SCOTT, 2000). Reach, then, evaluates the number of existing intermediaries between two distinct cliques. The lower the n-cliques, the faster the flow among the members becomes.

After analyzing the authors' centrality and cohesion, it was investigated whether the researchers' centrality indicators and scientific production were associated. For this analysis, Spearman's p correlation coefficient was used. This non-parametric test was applied because the research data did not comply with all premises for the use of parametric analyses.

4. RESULT ANALYSIS AND DISCUSSION

In this section, the results will be presented and discussed. First, the evolution in the number of articles and co-authorship networks was evaluated across the study period. Then, authors with scientific production in Accounting Teaching and Research were ranked according to their publication volume and regularity. Finally the centrality indicators (degree, betweenness and closeness), and also whether these indicators are associated with the scientific production of the authors and the identified cooperation networks.

4.1The Evolution in Accounting Teaching and Research

The study area Accounting Teaching and Research gave signs of advances during the analysis period. Based on the selected 215 papers, the academic community in the area included 357 authors. In the first year analyzed, only three authors were responsible for publishing two papers. This number contrasts with the final year, when 100 authors produced 45 papers. Table 1 demonstrates the evolution in the analysis period, complemented by Figure 1.

Table 1: Academic Production on Accounting Teaching and Research in the Analysis Period

Year	No. Articles	No. Authors	No. Authorships	No. Accumulated Articles	No. Accumulated Authors	No. Accumulated Authorships
1999	2	3	3	2	3	3
2000	1	2	2	3	5	5
2001	7	7	7	10	12	12
2002	7	17	17	17	29	29
2003	14	27	32	31	56	61
2004	13	26	29	44	82	90
2005	13	22	27	57	104	117
2006	31	68	78	88	172	195
2007	36	91	110	124	263	305
2008	46	117	141	170	380	446
2009	45	100	125	215	480	571

Obs.: The number of authors displayed does not exclude authors with publications in earlier years. Hence, the final number of accumulated authors was higher than the 357 different authors observed in this study. We decided to maintain the researchers in subsequent years following on the first publication to total all authors who published articles in that respective year, and not just the new entrants in the research field under analysis. The number of authorships represents the sum of the number of authors in each year, independently of whether a same author published two or more articles in the same year.

Source: Research Data

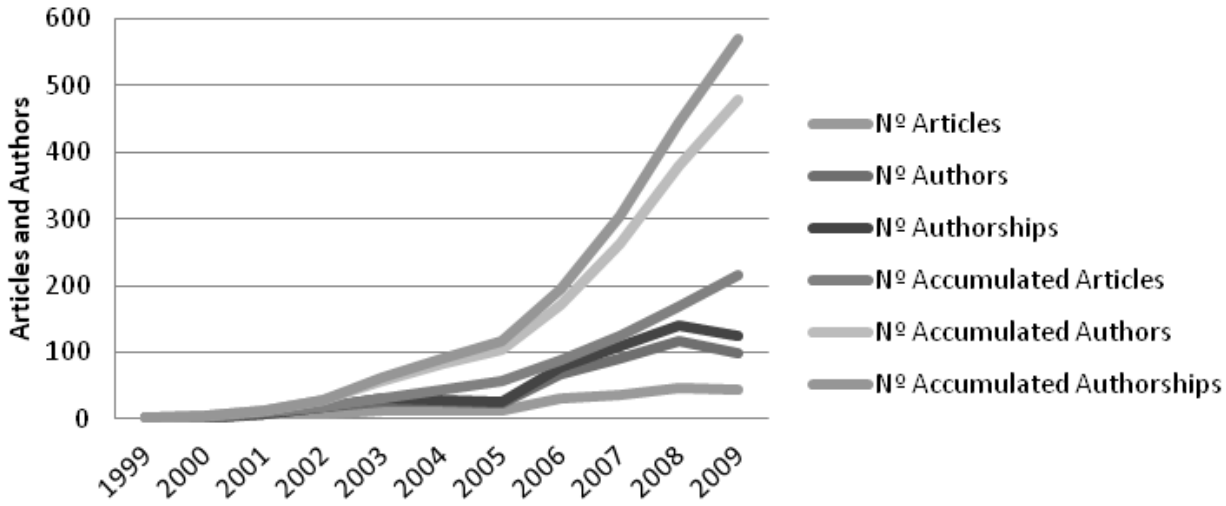


Figure 1: Evolution in Academic Production on Accounting Teaching and Research in the Analysis Period
Source: Research Data

Although the number of articles remained practically constant in the last two years, an increase was observed in earlier periods. The number of authors dropped between 2008 and 2009 though. Hence, less researchers were responsible for a constant scientific production in Accounting Teaching and Research. Table 2 lists the authors who most contributed to the theme area under analysis.

Table 2: Authors with Highest Number of Articles Published

Ord	Author	HEI	No. Authorships
1	MARTINS, G. A.	FEA/USP	13
2	CORNACHIONE Jr., E. B.	FEA/USP	11
3	CARDOSO, R. L.	Mackenzie	7
	LEITE FILHO, G. A.	UNIMONTES	7
	MURCIA, F. D.	UFSC	7
	PELEIAS, I. R.	FECAP	7
7	CUNHA, J. V. A.	UFMG	6
	DOMINGUES, M. J. C. S.	FURB	6
	MENDONÇA NETO, O. R.	FEA/USP	6
10	ANDRADE, J. X.	FEA/USP	5
	ARAUJO, A. M. P.	FEARP/USP	5
	BORBA, J. A.	UFSC	5
	NASCIMENTO, A. R.	FEA/USP	5
	NOVA, S. P. C. C.	FGV-SP	5
	OTT, E.	UNISINOS	5
	RICCIO, E. L.	FEA/USP	5
	SOUZA, M. A.	UNISINOS	5

Source: Research Data

Among the researchers with the largest number of articles, two stand out: Gilberto de Andrade Martins with 13 publications and Edgard Bruno Cornachione Jr. with 11. These were the authors that most contributed to the Accounting Teaching and Research area, in which 11.16% of the papers published involved one of these two researchers. It is underlined that these authors teach in graduate programs.

In addition, as observed in Table 2, three large groups were constituted, with seven, six and five papers published. These groups include four, three and eight researchers, respectively. Considering these authors and the first two listed above, more than half (51.16%) of the studies published on the theme in the investigated proceedings involved those authors.

The University of São Paulo School of Economics, Business Administration and Accountancy (FEA/USP) concentrates the majority of the most productive authors – six in total. Next come *Universidade Regional de Blumenau* (Furb), *Universidade Federal de Santa Catarina* (UFSC) and *Universidade do Vale do Rio dos Sinos* (Unisinos), with two authors each. One fact these HEI have in common is the existence of *stricto sensu* graduate Accountancy programs, which may explain the importance of these institutions to develop scientific knowledge in the research area. Table 3 presents the HEI ranking according to the number of authorships.

Table 3: Ranking of Higher Education Institutions according to Number of Authorships

HEI	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Total
FEA/USP	-	-	4	1	9	17	8	14	15	30	13	111
UFSC	-	-	-	-	-	-	-	10	15	13	1	39
Furb	-	-	-	-	3	-	2	6	7	10	7	35
UFPE	-	-	-	5	2	-	-	2	9	3	5	26
Unisinos	-	-	-	-	-	-	2	-	5	7	8	22
UnB	-	-	-	-	-	-	-	5	11	4	1	21
UFMG	-	-	-	-	8	-	-	1	1	3	7	20
Fecap	-	-	-	-	1	-	3	3	1	4	6	18
UFPR	-	-	-	-	-	1	-	2	-	4	10	17
Fucape	-	-	1	-	1	1	-	12	-	-	-	15
Mackenzie	-	-	-	-	1	2	-	-	2	7	3	15
UFRJ	-	-	-	-	-	-	-	-	5	-	10	15
UFRN	1	-	-	-	3	1	2	1	3	-	2	13
UFC	1	-	1	-	-	-	-	-	1	1	8	12
Fearp/USP	-	-	-	-	-	-	-	1	-	4	5	10
UFBA	-	-	-	-	2	-	2	-	-	4	2	10
UFPB	-	-	-	-	-	-	-	2	2	1	5	10
Others	1	2	1	11	2	7	8	19	33	46	32	162
Total	3	2	7	17	32	29	27	78	110	141	125	571

Source: Research Data

FEA/USP was the HEI with the largest number of authorships, totaling 111. This represents 19.44% of authorships. Next come UFSC and Furb, with 39 and 35 authorships, respectively. All HEI with less than ten publications were grouped under "Others", totaling 162 authorships, which represents 28.37% of all authorships. This shows that the Accounting Teaching and Research area receives important contributions from different institutions and is not restricted to a small number of universities.

It is underlined that, among the most productive HEI, none of them showed at least one papers during all years under analysis. FEA/USP also published one paper in a larger number of years (one in total). Next, the *Universidade Federal do Rio Grande do Norte* (UFRN) showed publications in seven different years. The HEI that concentrated its authorship in the shortest period was the *Universidade Federal do Rio de Janeiro* (UFRJ), with five in 2007 and ten in 2009.

4.2 Author Ranking

The authors' ranking was based on their entire activity published in the congress proceedings under analysis, considering the volume and regularity of their scientific production. This classification method was developed by Guarido Filho, Machado-da-Silva and Gonçalves (2009), adapting the approaches by Braun, Glanzel and Schubert (2001) and Gordon (2007). Table 4 presents the classification criteria and number of authors per category.

Table 4: Distribution of Researchers in Production and Continuity Categories

Category	Description	Authors	AA	AA/Authors
Continuants	More than one publication distributed across five or more different years, with at least one in the last three years.	5 (1.40%)	42	8.4
Transients	More than one publication distributed across no more than four different years, with at least one in the last three years and at least one in earlier years.	35 (9.80%)	122	3.49
One-timers	Only one publication across the analysis period.	260 (72.83%)	260	1
Entrants	More than one publication in one or more different years, (exclusively) in the last three years.	41 (11.48%)	108	2.63
Terminants	More than one publication in one or more different years, but without publications in the last three years.	16 (4.49%)	39	2.4375
Total		357	571	

Obs.: AA = Article Authorships totals the presence of authors in articles and, therefore, the total number is higher than the number of articles under analysis; AA/Authors = number of authorships in articles divided by the number of authors in a given category, reflecting the mean number of article authorships per author.

Source: adapted from Guarido Filho, Machado-da-Silva and Gonçalves (2009) and research data

Regarding the large volume of one-timers, these can return to the research field under analysis in the future, either as entrants or transients (GUARIDO FILHO, MACHADO-DA-SILVA and GONÇALVES, 2009). Hence, this number not only represents researchers who lost interest in the area after publishing an article. This category of researchers stands out in the research universe, representing that, for every ten researchers with publications on Accounting Teaching and Research – seven are one-timers. This supports the great dispersions of authors in the area, in line with the premise of Latko's Law, stating that some authors are responsible for many studies, while many authors publish little.

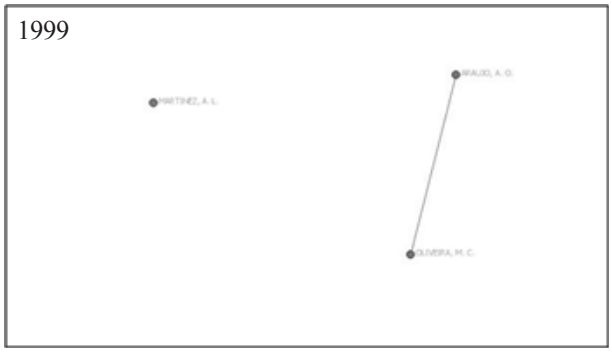
Also, entrant researchers' participation in the set of publications considered stands out. Out of 357 authors, 11.48% fit into this category, as the second largest in number of elements. This leads to the belief that experts' interest in the area is increasing.

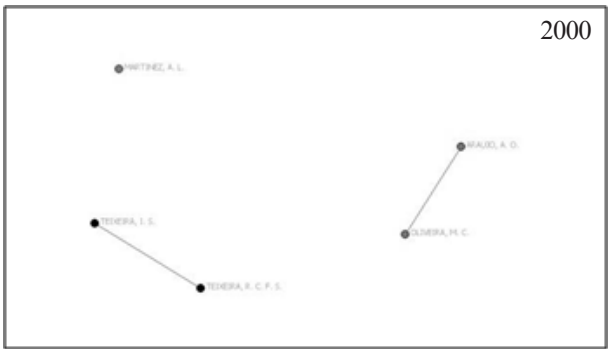
The importance of continuant researchers can be observed through the mean number of authorships per author. The coefficient 8.4 represents that, despite the small number of experts in this group, their scientific production is representative. As these authors present publications across a longitudinal period of five years or more, in their studies, they may demonstrate changes in the study area.

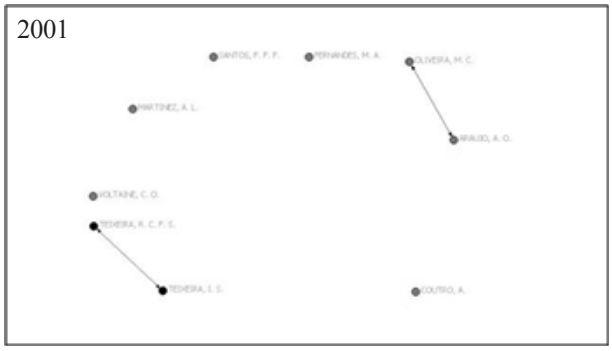
4.3 Co-Authorship Networks in Accounting Teaching and Research

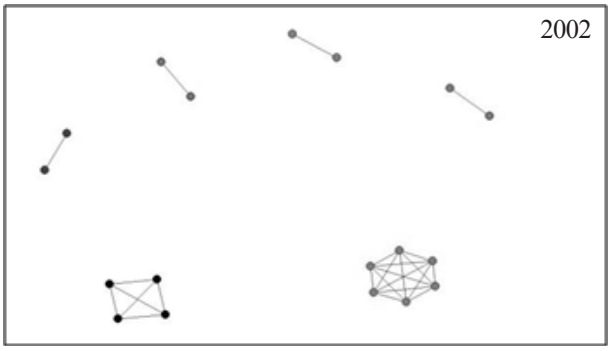
The academic community responsible for the 215 papers investigated in this study comprised 357 researchers. These authors are graphically represented in Figure 3 through the knots shown in the networks. The links evidence existing relations among the experts.

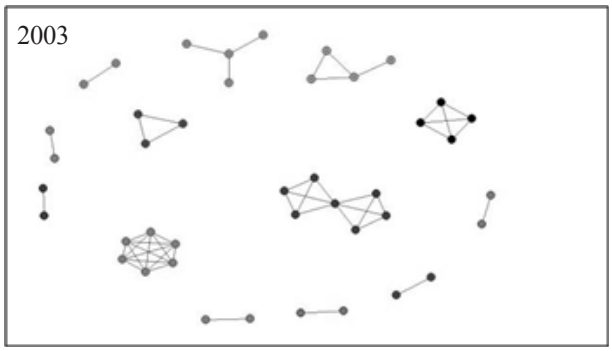
Across the research period, a network was elaborated for each year, maintaining the relations observed in earlier periods. This procedure helps to observe the changes that took place in the academic community.

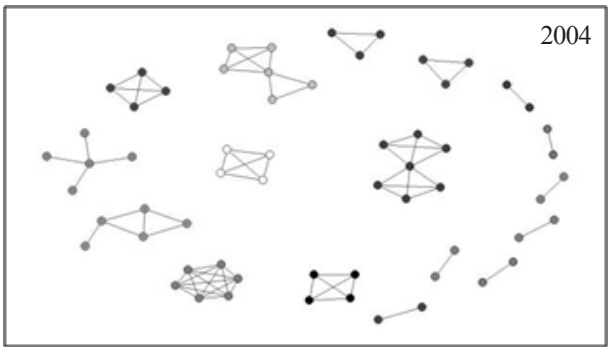

1999

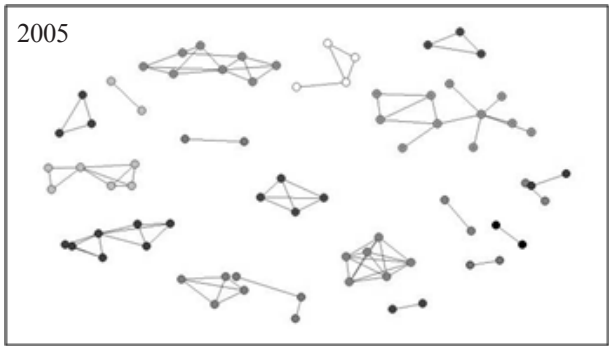

2000

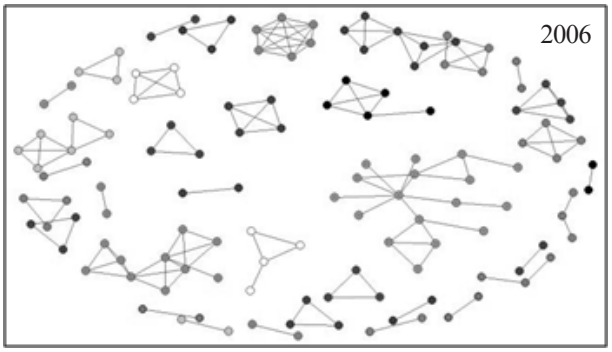

2001

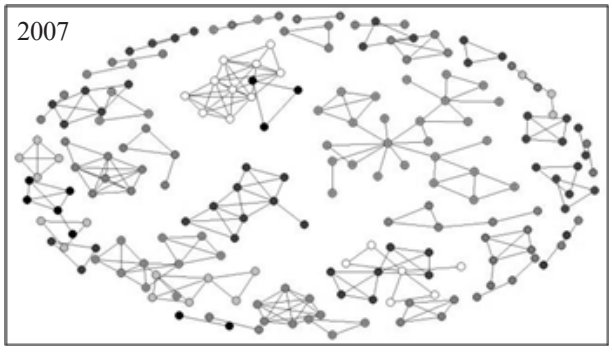

2002

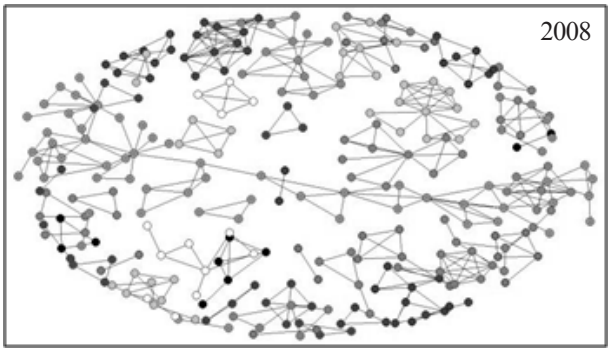

2003


2004


2005


2006


2007


2008

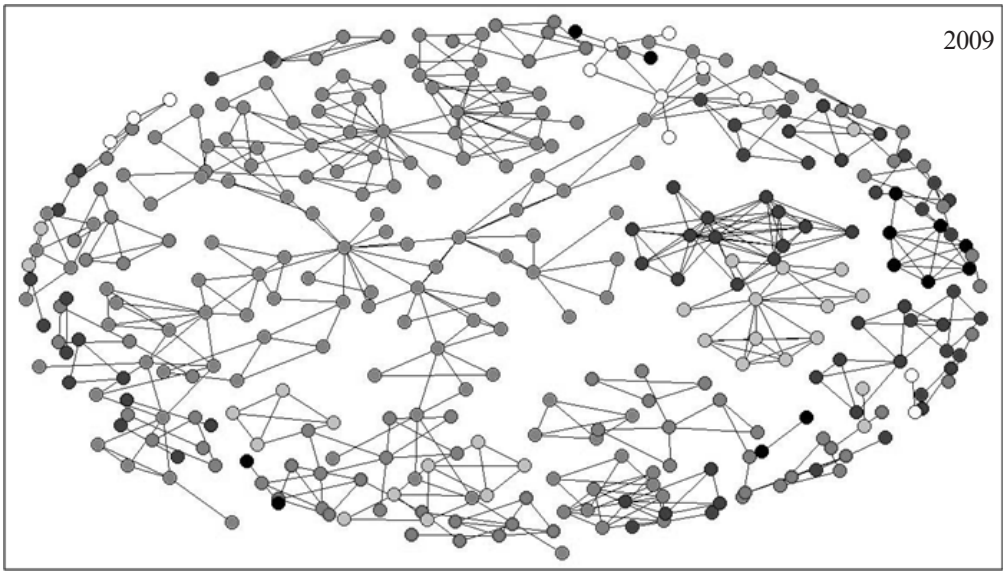


Figure 2: Evolution of Co-Authorship Networks in the Analysis Period
Source: Research Data

During the first three years analyzed, publications were developed either individually or by two authors. As from 2002, small groups started to develop. In 2003, the number of groups increased and, in subsequent years, the number of elements in each co-authorship network rises. This fact underlines other authors' assertions about the ascent of co-authored research (LABAND and TOLLISON, 2000; CRONIN, SHAW and LA BARRE, 2003; MOODY, 2004; ACEDO et al., 2006). In Table 5, the characteristics of the research networks are listed.

Table 5: Main Characteristics of Co-Authorship Networks

Year	Number of Groups	Size of largest Group	Number of Authorships in Largest Group	Size of Second Largest Group	Number of Authorships in Second Largest Group	Isolated Authors
1999	1	2	2	0	0	1
2000	2	2	2	2	2	1
2001	2	2	3	2	2	8
2002	6	6	6	4	4	11
2003	13	7	8	6	6	14
2004	17	7	8	6	7	21
2005	19	11	24	8	10	29
2006	35	17	43	10	14	42
2007	46	26	60	10	16	68
2008	54	49	113	13	18	107
2009	60	70	161	44	76	142

Source: Research Data

In Table 5, the importance of co-authorship networks for Accounting Teaching and Research can be observed. On average, during the research period, the largest group was responsible for 26.4% of authorships. When considering the first two groups, this average increases to 37.9%. The largest group in 2009, involving 161 authorships, was responsible for 28.2% of accumulated authorships in the research sample. Figure 3 and Table 6 present this network.

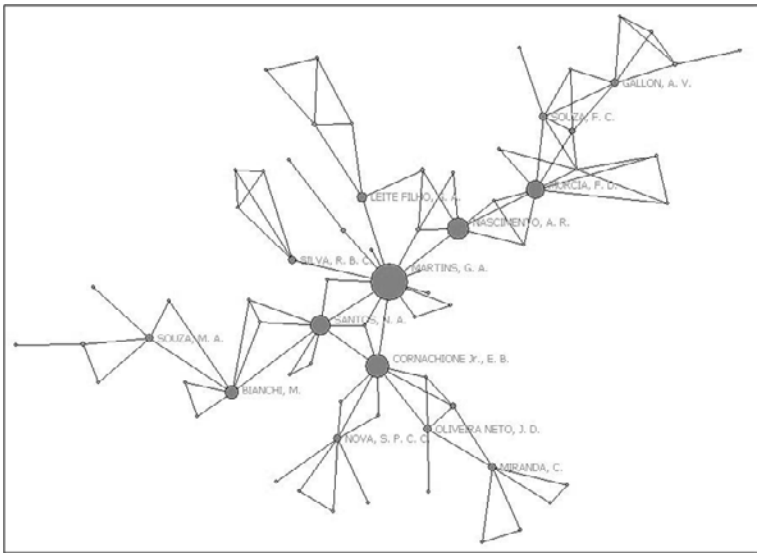


Figure 3: Main Co-authorship Network
Source: Research Data

In Figure 3, the size of each knot, representing the authors who are part of the cooperative network, was defined by their betweenness centrality coefficient, graphically showing the importance of each researcher in the information flow that exists in the group. Thus, the author Martins is responsible for more intermediations in the main cooperation network established in the study period. Other authors, like Cornachione Jr., Santos, Nascimento and Murcia, intermediated among experts in the peripheral region of the network and the center of the group.

Table 6: Distribution of Authors in the Main Co-Authorship Network

Criterion	Category	No. of Authors	No. of Authorships
Number of Authors According to Production and Continuity Category	Continuants	2	24
	Transients	13	52
	One-Timers	42	42
	Entrants	10	33
	Terminants	3	10
Number of Authors according to affiliated HEI	Fafibe	2	3
	FEA/USP	27	70
	Furb	2	8
	UFRGS	3	5
	UFRJ	4	4
	UFSC	11	28
	Unisinos	5	12
	Univali	2	2
	Others	14	29

Obs.: The HEI with only one author in the co-authorship network were concentrated in the category "Others", including: Faculdade Machado de Assis; Fundação Getúlio Vargas (FGV-SP); Furg; Mackenzie; Universidade Estadual de Londrina (UEL); Universidade Federal de Minas Geris (UFMG); Universidade Federal de Pernambuco (UFPB); Universidade Federal do Piauí (UFPI); UFRN; Universidade Federal Rural do Rio de Janeiro (UFRRJ); Universidade Federal de Viçosa (UFV); Universidade de Montes Claros (Unimontes); e, Centro Universitário Unirg (Unirg).

Source: Research Data

When considering the ranking discussed earlier, considering the authors' production and continuity, the main co-authorship network in Accounting Teaching and Research consisted of researchers classified as one-timers. It is highlighted, however, that although more numerous, this category did not show the largest number of authorships. Transients, corresponding to 13 authors in this group, were responsible for 32.3% of authorships, totaling 52, as opposed to 42 in the first category. Finally, it is also observed that 11 of the most productive authors in the area belong to this co-authorship network.

Concerning the HEI the expert was affiliated with, FEA/USP showed the largest number of elements. Twenty-seven researchers represented this institution, responsible for 70 authorships (43.5%). UFSC also stood out, with 11 authors in this main group, who contributed with 28 authorships (17.4%).

To assess the HEI's contribution to the theme area Accounting Teaching and Research, the co-authorship network was developed for the study period. In this new network, only the HEI of affiliation were considered, and no longer the author's name. Figure 4 demonstrates how the institutions are related.

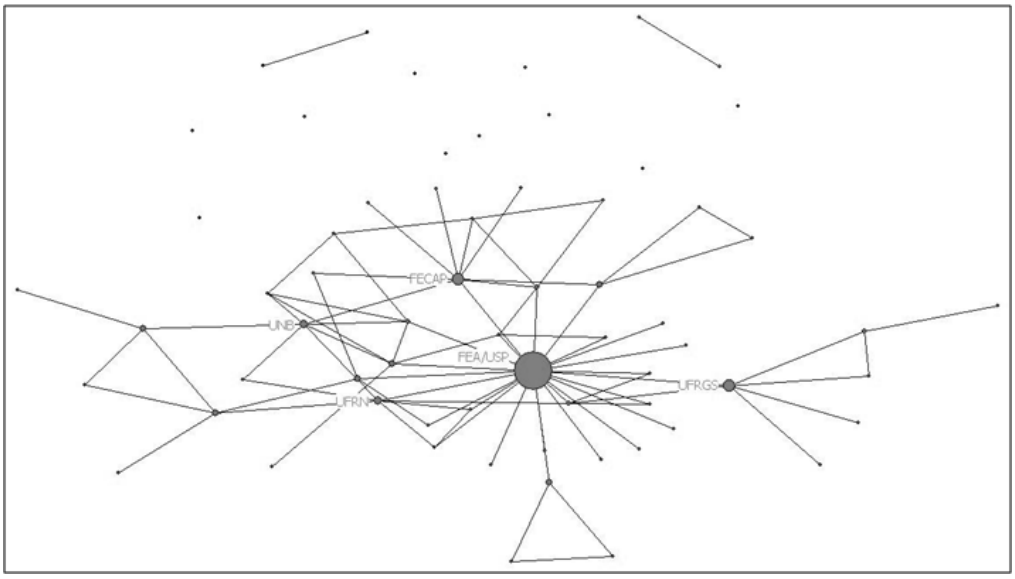


Figure 4: Co-authorship network among HEI

Source:: Research Data

When considering inter-institutional cooperation, the cooperation groups were established. Two of them consisted of only two HEI, and the third contained 50 elements. The existence of isolated institutions was also observed, who worked in isolation, without cooperating with others. In total, ten HEI showed no co-authorships. According to Espartel, Basso and Rech (2008), high levels of integration among institutions further contribute to the study area, as different views on research problems and work methods converge.

When considering the HEI's betweenness centrality, it was verified that FEA/USP was the most important HEI. When considering the intermediating role among peripheral institutions in the cooperation network on Accounting Teaching and Research, four other HEI stood out: Universidade de Brasília (UnB), Universidade Federal do Rio Grande do Sul (UFRGS), UFRN and Fundação Escola de Comércio Álvaro Penteado (Fecap).

4.4 Centrality Indicators and Association with Scientific Production

In this section, each network actor was evaluated according to his/her centrality indicators and, then, it was verified whether these indicators were associated with that element's scientific production. First, the researchers were focused on, and then the affiliation institutions.

The degree centrality evaluates each author's number of direct relationships. That is, each researcher's number of local links is used to measure this indicator. Table 7 presents the ten experts with the highest degree centrality.

Table 7: Ten authors with highest degree centrality

Author	Degree
CARDOSO, R. L.	20
PELEIAS, I. R.	19
MARTINS, G. A.	19
LOPES, J. E. G.	18
PEDENEIRAS, M. M. M.	18
RIBEIRO FILHO, J. F.	18
CORNACHIONE Jr., E. B.	17
MURCIA, F. D.	16
MENDONÇA NETO, O. R.	15
DOMINGUES, M. J. C. S.	15

Source: Research Data

The expert with the largest number of direct relations and, thus, the highest degree centrality coefficient, was Cardoso. The same author figures among the most productive researchers in the area. Peleias and Martins ranked first, with a coefficient of 19 each. Third are Lopes, Pederneiras and Ribeiro Filho.

The second indicator measured closeness centrality. It assesses the distance between an actor and all other elements in the same network. Thus, this indicator verifies not only direct, but also indirect relationships. The ten authors with the highest closeness centrality coefficients are listed in Table 8.

Table 8: Ten authors with highest closeness centrality

Author	Closeness
MARTINS, G. A.	34
CORNACHIONE Jr., E. B.	31
SANTOS, N. A.	30
PELEIAS, I. R.	30
NASCIMENTO, A. R.	28
CUNHA, J. V. A.	26
MURCIA, F. D.	26
DOMINGUES, M. J. C. S.	26
JUNQUEIRA, E. R.	25
BIANCHI, M.	25

Source: Research Data

In Accounting Teaching and Research, Martins presented the highest closeness centrality coefficient. Next comes Cornachione Jr. In this respect, the two most productive authors occupied the first two rankings. Also, Cardoso, who obtained the highest degree centrality coefficient, does not figure among the ten researchers with the highest closeness coefficient.

Finally, the betweenness centrality indicator was assessed. This indicator focuses on the interaction between two actors provided by a third element. Table 9 lists the researchers with the highest betweenness coefficient.

Table 9: Ten authors with highest betweenness centrality

Author	Betweenness
MARTINS, G. A.	1567
CORNACHIONE Jr., E. B.	912
NASCIMENTO, A. R.	889
SANTOS, N. A.	759
MURCIA, F. D.	743
PELEIAS, I. R.	686
BIANCHI, M.	500
DOMINGUES, M. J. C. S.	296
LEITE FILHO, G. A.	275
NOVA, S. P. C. C.	266

Source: Research Data

Like in the closeness centrality ranking, Martins and Cornachione Jr. occupied the first positions in terms of betweenness centrality in the relationship network. The experts listed in Table 9 are the authors that most contributed to the knowledge flow in Accounting Teaching and Research.

Table 10 below presents the same centrality indicators used to assess the researchers. This time, however, the focus is concentrated on the authors' institutions of affiliation.

Table 10: Centrality Indicators of Higher Education Institutions

Degree Centrality		Closeness Centrality		Betweenness Centrality	
HEI	**Degree**	**HEI**	**Closeness**	**HEI**	**Betweenness**
FEA/USP	50	FEA/USP	36	FEA/USP	846
UnB	15	Fecap	27	UFRGS	227
UFPE	11	UFRN	25	Fecap	227
Mackenzie	10	UFPB	24	UFRN	125
UFRN	10	UFV	24	UnB	122
UFCG	10	UFPE	24	UFC	104
Fecap	9	Furb	24	FGV-SP	94
Furb	9	UFRGS	24	Mackenzie	94
UFMG	8	Mackenzie	23	UFPB	79
UFV	8	UnB	23	Fearp/USP	69

Source: Research Data

In the three rankings, FEA/USP was the HEI with the highest centrality coefficients. It is also highlighted that the institution's score differences largely exceed the elements ranked second, mainly in terms of degree and betweenness centrality.

In the assessment of direct relations, using degree centrality, UnB ranked second, followed by UFPE. When considering closeness centrality, Fecap and UFRN occupy the first three rankings together with FEA/USP. And, among the HEI that most contribute to the knowledge flow, acting as important elements of betweenness among other institutions, UFRGS and Fecap rank second, followed by UFRN.

To assess whether the centrality indicators are associated with the researchers' scientific production, Spearman's p correlation was used. This non-parametric test was used because the research data did not comply with all premises for the use of parametric analyses. The result found has been summarized in Table 11.

Table 11: Result of Spearman's *p* Correlation

Target Population	Variables	Spearman's *p*	.sig
Researchers	Authorships x Degree	0.618	0.000
	Authorships x Closeness	0.354	0.000
	Authorships x Betweenness	0.821	0.000
Higher Education Institutions	Authorships x Degree	0.604	0.000
	Authorships x Closeness	0.492	0.000
	Authorships x Betweenness	0.678	0.000

Source: Research Data

With significance set at 5% (.sig < 0.05), Spearman's non-parametric p test showed an association between the analyzed elements' centrality indicators and scientific production, as observed in earlier studies (ROSSONI and GUARIDO FILHO, 2007; ROSSONI, HOCAYEN-DA-SILVA and FERREIRA Jr., 2008). This correlation was found when investigating the researchers as well as the institutions they are affiliated with. In all cases, .sig remained below 0.001.

For the researchers, the association between authorships and degree centrality was moderate, with a correlation coefficient of 0.618. The correlation between scientific production and closeness centrality, on the other hand, was weak, with a Spearman's p-value of 0.354. The centrality indicator with the strongest association was betweenness. Its correlation coefficient totaled 0.821. Thus, according to this investigation, the more the author intermediates among other experts, the greater his/her role in papers will be.

In the analysis of the Higher Education Institutions, the association between the number of authorships and the centrality indicators was moderate. This classification was observed in the three measures used. Like in the researchers' evaluation, however, the highest correlation coefficient was found for betweenness centrality (0.678). This demonstrates that the HEI that link different groups and thus enhance knowledge exchange tend to join more authorships.

5. FINAL CONSIDERATIONS

Scientific knowledge is socially developed, through the existing relations among the actors who constitute networks among higher education institutions (ROSSONI, HOCAYEN-DA-SILVA e FERREIRA Jr., 2008). Departing from this premise, the aim in this study was to map, through the analysis of social networks, collaborative interactions in studies on Accounting Teaching and Research. Therefore, 215 articles were analyzed about the research theme, published in the proceedings of the main accounting congresses.

Based on data analysis, researchers' growing interest in the research area was observed, as demonstrated by the increase in the number of articles across the empirical research period. The main authors include Gilberto de Andrade Martins and Edgard Bruno Cornachione Jr., who represent the most productive experts. Both are affiliated with the University of São Paulo, the Higher Education Institution responsible for the largest number of authorships during the period.

When ranking the researchers according to publication volume and regularity, most authorships were concentrated in authors who only published one paper during the analysis period. These researchers were categorized as one-timers. This demonstrates the existing dispersion in the research area, which means that scientific production is not concentrated in few authors. The entrant category, including researchers who contributed with more than one study exclusively during the last three years under analysis obtained the second highest number of authorships. This fact underlines the growing interest in Accounting Teaching and Research.

Different authors affirm that the number of papers elaborated in partnerships has increased (LABAND and TOLLISON, 2000; CRONIN, SHAW and LA BARRE, 2003; MOODY, 2004; ACEDO et al., 2006). In the study developed here, it was verified that this phenomenon also occurs in the research area. According to the development of collaborative networks, it was observed that, during the first years analyzed, one or two authors at most developed the studies. As from 2002, however, large cooperative groups started to be established, based on different studies elaborated in partnership.

Based on the analysis, it was verified that the most productive HEI in the theme area under analysis offer graduate programs in Accountancy. In addition, the authors with the largest number of papers published and with higher centrality coefficients serve as faculty in these graduate programs. Thus, it can be suggested that the central actors in the research area Accounting Teaching and Research are faculty members in *stricto sensu* graduate programs, who present the theme area to their students, contributing to the significant increase in the number of entrants and the development of the research area.

Finally, it was investigated whether the researchers and HEI's centrality indicators are associated with their respective scientific productions. In both cases, a significant positive correlation was observed. Based on the analysis technique used, however, it cannot be affirmed that the increase in the authors' centrality attributes is directly responsible for the growth in the author's number of publications. Therefore, it is suggested that the research phenomenon is biased.

In addition, the present study should be expanded, also considering journals that were not part of this preliminary analysis. That would permit checking the permanence of the characteristics found here, using a larger sample. Also, existing collaborative networks in Accounting Teaching and Research could be compared with other accounting knowledge branches, in order to discover whether distinct research patterns exist.

6. REFERENCES

ACEDO, Francisco José; BARROSO, Carmen; ROCHA, Cristóbal Casanueva; GALÁN, José Luis. Co-Authorship in Management and Organizational Studies: An Empirical and Network Analysis. **Journal of Management Studies**, v. 43, n. 5, p.957-983, jul. 2006.

BARABASI, A. L.; JEONG, H.; NÉDA, Z.; RAVASZ, E; SCHUBERT, A.; VICSEK, T. Evolution of the social network of scientific collaborations. **Physica A**, v. 311, n. 3, p. 590-614, aug.2002.

BARNETT, Andy H.; AULT, Richard W.; KASERMAN, David L. The Rising Incidence of Co-authorship in Economics: Further Evidence. **Review of Economics and Statistics**, v. 70, n. 3, p. 539-543, aug. 1988.

BATISTELLA, Flávio Donizete; BONACIM, Carlos Alberto Grespan; MARTINS, Gilberto de Andrade. Contrastando as Produções da Revista Contabilidade & Finanças da (FEA-USP) e Revista Base (UNISINOS). **Revista de Educação e Pesquisa em Contabilidade,** v. 2, n. 3, p. 84-101, set./dez. 2008.

BORBA, José Alonso; MURCIA, Fernando Dal-Ri. Oportunidades para Pesquisa e Publicação em Contabilidade: Um Estudo Preliminar sobre as Revistas Acadêmicas de Língua Inglesa do Portal de Periódicos da CAPES. **Brazilian Business Review**, v. 3, n. 1, p. 88-103, jan./jun. 2006.

BRAUN, T., GLÄNZEL, W.; SCHUBERT, A. Publication and cooperation patterns of the authors of neuroscience journals. **Scientometrics**, v. 51, n. 3, p. 499-510, jul. 2001.

CRONIN, Blaise; SHAW, Debora; LA BARRE, Kathryn. Visible, Less Visible, and Invisible Work: Patterns of Collaboration in 20th Century Chemistry. **Journal of the American Society for Information Science and Technology,** v. 55, n. 2, p. 160-168, jan. 2003.

CRUZ, Ana Paula Capuano da; ESPEJO, Márcia Maria Bortolocci; GASSNER, Flávia Pozzera. Uma Análise da Evolução do Campo de Pesquisa em Contabilidade Gerencial sob a Perspectiva Colaborativa Mapeada em Redes Sociais. In: ENCONTRO DA ANPAD, 33., 2009, São Paulo. **Anais...** São Paulo: ANPAD, 2009.

EMIRBAYER, Mustafa.; GOODWIN, Jeef. Network analysis, culture and the problem of agency. **American Journal of Sociology**, v. 99, n. 6, p. 1411-54, may 1994.

ESPARTEL, Lélis Balestrin; BASSO, Kenny; RECH, Eduardo. Co-autoria em Marketing no Brasil: Uma Análise dos Artigos Publicados no Enanpad e no EMA entre 1998 e 2007. In: ENCONTRO DA ANPAD, 32., 2008, Rio de Janeiro. **Anais...** Rio de Janeiro: ANPAD, 2008.

ESPEJO, Márcia Maria dos Santos Bortolocci; CRUZ, Ana Paula Capuano da; WALTER, Silvana Anita; GASSNER, Flávia Pozzera. Campo de pesquisa em contabilidade: uma análise de redes sob a perspectiva institucional. **Revista de Educação e Pesquisa em Contabilidade**, v. 3, n. 2, p. 45-71, mai./ago. 2009.

FREEMAN, L. C. Centrality in social networks: Conceptual Clarification. ***Social Networks***, v. 1, n. 3, p. 215-239, 1979.

GORDON, A. Transient and continuant authors in a research field: the case of terrorism. **Scientometrics**, v. 72, n. 2, p. 213-224, aug. 2007.

GRAEML, Alexandre Reis; MACADAR, Marie Anee; GUARIDO FILHO, Edson; ROSSONI, Luciano. Redes Sociais e Intelectuais em ADI: Uma Análise Cientométrica do Período 1997-2006. In: ENCONTRO DA ANPAD, 32., 2008, Rio de Janeiro. **Anais.**.. Rio de Janeiro: ANPAD, 2008.

GUARIDO FILHO, Edson Ronaldo; MACHADO-DA-SILVA, Clóvis L.; GONÇALVES, Sandro Aparecido. Institucionalização da Teoria Institucional no Contexto dos Estudos Organizacionais no Brasil. In: ENCONTRO DA ANPAD, 33., 2009, São Paulo. **Anais**... São Paulo: ANPAD, 2009.

HANNEMAN, R. A.; RIDDLE, M. **Introduction to Social Network Methods**. Riverside: University of Califórnia, 2005. Available from: <http://faculty.ucr.edu/~hanneman/nettext/index.html> Accessed on: 05/10/2010.

HUDSON, John. Trends in Multi-Authored Papers in Economics. **The Journal of Economic Perspectives,** v. 10, n. 3, 1996.

KATZ, J. Sylvan.; MARTIN, Ben R. What is research collaboration? **Research Policy.** v.26, n. 1, p.1-18, mar. 1997.

LABAND, David N.; TOLLISON, Robert D. Intellectual Collaboration. **The Journal of Political Economy,** v. 108, n. 3, p. 632-662, jun. 2000.

LEITE FILHO, Geraldo Alemandro. Padrões de produtividade de autores em periódicos e congressos na área de contabilidade no Brasil: um estudo bibliométrico. In: Congresso USP de Controladoria e Contabilidade, 6., 2006, São Paulo. **Anais** ... São Paulo: FEA/USP, 2006. CD-ROM.

LIU, Xiaoming; BOLLEN, Johan; NELSON, Michael L.; VAN DE SOMPEL, Herbert. Co-authorship networks in the Digital Library Research Community. **Information Processing & Management,** v. 41, p. 1462-1480, 2005.

LYRIO, Maurício Vasconcellos Leão; BORBA, José Alonso; COSTA, Jeane Maria da. Controle Gerencial: Delineamento do Perfil Metodológico de uma Amostragem de Publicações Acadêmicas nas Áreas de Administração e Contabilidade de 2000 a 2004. **BASE – Revista de Administração e Contabilidade da Unisinos,** v. 4, n. 2, 126-136, mai./ago.2007.

MACHADO, Márcia Reis; NASCIMENTO, Artur Roberto do; MURCIA, Fernando Dal-Ri. Análise Crítica – Epistemológica da Produção Científica em Contabilidade Social e Ambiental no Brasil. In: CONGRESSO USP DE CONTROLADORIA E CONTABILIDADE, 9., 2009, São Paulo. **Anais...** São Paulo: FEA/USP, 2009.

MARTELETO, Regina Maria. Análise de Redes Sociais: Aplicação nos Estudos de Transferência de Informações. **Ci. Inf**., v. 30, n. 1, p. 71-81, jan./abr. 2001.

MOODY, James. The Structure of a Social Science Collaboration Network: Disciplinary Cohesion from 1963 to 1999. **American Sociological Review**, v. 69, n. 2, p. 213-238, Apr. 2004.

NASCIMENTO, Artur Roberto do; RIBEIRO, Daniel Cerqueira; JUNQUEIRA, Emanuel R.. Estado da Arte da Abordagem Comportamental da Contabilidade Gerencial: Análise das Pesquisas Internacionais. In: CONGRESSO USP DE CONTROLADORIA E CONTABILIDADE, 8., 2008, São Paulo. **Anais...** São Paulo FEA/USP, 2008.

NELSON, Reed. Uso da Análise de Redes Sociais no Estudo das Estruturas Organizacionais. **Revista de Administração de Empresas**, v. 24, n. 4, p. 150-157, out./dez. 1984.

NEWMAN, M. E. J. Scientific collaboration networks. I. Network construction and fundamental results. **Physical Review E**, v. 64, 16131, p. 1-8, 2001.

ROSSONI, Luciano; GUARIDO FILHO, Edson Ronaldo. Cooperação Interinstitucional no Campo de Pesquisa em Estratégia. **Revista de Administração de Empresas**, v. 47, n. 4, p. 74-88, out./dez. 2007.

ROSSONI, Luciano; MACHADO-DA-SILVA, Clóvis Luis. Coesão estrutural e construção do conhecimento científico no campo da Estratégia. In: ENCONTRO DE ESTUDOS EM ESTRATÉGIA, 3., 2007, São Paulo. **Anais...** Rio de Janeiro: ANPAD, 2007.

ROSSONI, Luciano; HOCAYEN-DA-SILVA, Antônio João; FERREIRA Jr.; Israel. Aspectos Estruturais da Cooperação entre Pesquisadores no Campo da Administração Pública e Gestão Social: Análise das Redes entre Instituições no Brasil. **Revista de Administração Pública**, v. 42, n. 6, p. 1041-1067, nov./dez. 2008.

SCOTT, J. **Social Network Analysis**: A Handbook. 2. ed. London: Sage Publications, 2000.

SOUZA, Flávia Cruz de Souza; SULIANI, Rover; GALLON, Alessandra Vasconcelos; ENSSLIN, Sandra Rolim. Análise das IES da Área de Ciências Contábeis e de seus Pesquisadores por meio de sua produção científica. **Revista Contabilidade Vista e Revista**, v. 19, n. 3, p. 15-38, jul./set. 2008.

VOOS, H. Lotka and Information Science. **Journal of the American Society of Information Science,** New York, v. 25, p. 270-272, July/Aug. 1974.

WAKEFIELD, Robin. Networks of accounting research: A citation-based structural and network analysis. **The British Accounting Review**, v. 40, p. 228 – 244, 2008.

WALTER, Silvana Anita; SILVA, Eduardo Damião da. Visão Baseada em Recursos: um Estudo Bibliométrico e de Redes Sociais da Produção Científica da Área de Estratégia do EnANPAD 1997-2007. In: ENCONTRO DA ANPAD, 32., 2008, Rio de Janeiro. **Anais...** Rio de Janeiro: ANPAD, 2008.

WASSERMAN, S.; FAUST, K. **Social Network Analysis**: Methods and Applications. Cambridge: Cambridge University Press, 1994.

WELLMAN, Barry. Structural Analysis: From method and metaphor to theory and substance. In: WELLMAN, B.; BERKOWITZ, S. D. **Social Structures**: a network approach. Cambridge: Cambridge University Press, 1988