

Dynamics of the scientific community network within the strategic management field through the *Strategic Management Journal* 1980–2009: the role of cooperation

Guillermo Armando Ronda-Pupo · Luis Ángel Guerras-Martín

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Abstract The paper presents the dynamics of the strategic management scientific community network during knowledge creation and dissemination through the *Strategic Management Journal* from 1980 to 2009. The paper describes the evolution of the participant countries' position within the network structure. We present the different stages that the network goes through, the vertices' transformation into nodes and hubs, and the statistical significance level of cooperation between the country in the core position and the countries in the semi-periphery and periphery positions during their evolution and growth.

Keywords Strategic management · Scientific community network · *Strategic Management Journal* · Knowledge creation and dissemination · Virtual community

Introduction

Strategic management, as an academic research-based discipline, emerged during the first half of the 1960s. The preliminary works in this field were: “*Chapters in the History of American Industrial Enterprise*” (Chandler 1962), “*Corporate Strategy*” (Ansoff 1965), “*Business Policy: Text and Cases*” (Learned et al. 1965), “*The Concept of Corporate Strategy*” (Andrews 1971), and “*Strategy Formulation: Analytical Concepts*” (Hofer and Schendel 1978). These works became the classics of strategic management theory and

G. A. Ronda-Pupo
Centro de Estudios Turísticos, Universidad de Holguín, Holguín, Cuba

G. A. Ronda-Pupo (✉)
Centro de Estudios Turísticos, Universidad de Holguín, Cuba, Ave XX Aniversario,
Piedra Blanca, Holguín CP 80100, Cuba
e-mail: gronda@facii.uho.edu.cu; rondapupo@yahoo.com

L. Á. Guerras-Martín
Strategic Management, Departamento de Economía de la Empresa (Administración, Dirección y Organización), Universidad Rey Juan Carlos, Paseo de los Artilleros, s/n 28032, Madrid, Spain
e-mail: luisangel.guerras@urjc.es

additionally contributed to a quick introduction and consolidation of new concepts within the field.

Although there are several different definitions of strategic management as a field for research, we adopt that of Nag et al. (2007), which emerges as a synthesis in their study: “The field of strategic management deals with the major intended and emergent initiatives taken by general managers on behalf of owners, involving utilization of resources, to enhance the performance of firms in their external environments” (p. 944).

Throughout the development of the discipline, several specific features have been studied. Among the most important are the following: (a) teaching of management strategy at universities, mostly in the USA (Eldredge and Galloway 1983; Gordon and Howell 1959; Summer et al. 1990); (b) the discipline’s intellectual structure, main authors and articles (Furrer et al. 2008; Nerur et al. 2008; Ramos Rodriguez and Ruiz Navarro 2004); (c) the definition of the construct and scope of strategic management as a field of study (Feurer and Chaharbaghi 1995; Fréry 2006); (d) the analysis and introduction of statistical methods for inquiring into the strategic management field (Hahn and Doh 2006; Hoetker 2006; Hulland 1999; Ketchen and Shook 1996); and (e) research on the journals’ influence over the evolution of the discipline (Franke et al. 1990; Tahai and Meyer 1999; Phelan et al. 2002; Podsakoff et al. 2005; Azar and Brock 2008).

Each of the previously mentioned trends contributed to knowledge building as well as to a quick and sustained growth of scientific output within the field. Thus, these trends favored the creation and consolidation of the intellectual structure of strategic management and the origin of a solid theoretical body of work that has turned strategic management into a scientific discipline within the business administration field.

The *Strategic Management Journal (SMJ)* has played a leading role in achieving such important results since its early beginnings in 1980, which marked a turning point in the historical evolution of the scientific community inquiring into the discipline. Eventually, the journal became the leader in knowledge building and dissemination in this particular area and one of the first journals to introduce management as a whole. In 2010, the *Strategic Management Journal* has reached its 30th anniversary; throughout all these years, it has constantly issued several publications and articles specialized in strategic management, easing the identification and mapping of the network of countries inherent to the discipline.

However, consultation of the literature reveals a gap that makes it difficult to disentangle the following questions: How has the network structure of the scientific community of the strategic management field been built around the *SMJ* and how has it evolved? What stages has the network structure passed through for knowledge building and dissemination in the strategic management field? What are the features of these stages? What distinguishes the researchers’ network structure in strategic management around the *SMJ*? How has cooperation influenced the inclusion of new countries for knowledge creation, development and dissemination in the strategic management field? What is the importance of inter-country cooperation for knowledge creation, development, and expansion in strategic management?

The answers to these questions will enrich the knowledge we already have regarding the intellectual structure of strategic management as a field of investigation, since they will provide the structural map for the construction, growth, and transformation of the scientific community around the *SMJ* on its 30th anniversary. The literature consulted has not contributed any evidence related to the emergence, evolution and dissemination of the scientific community of the strategic management field. The following information will enrich the conceptual insight of the discipline as a scientific research field.

Therefore, the objectives of the paper are: (1) to establish the dynamics of the evolution of the network of the strategic management scientific community during knowledge creation, development and dissemination through the *SMJ*. (2) To ascertain the different stages which the network of the scientific community of the discipline has gone through, and their characteristics; (3) to determine the significance level of inter-country cooperation for countries' development, regarding the generation and expansion of knowledge in the strategic management field.

Literature background

This paper is based on a set of articles about the strategic management field, which can be classified into two groups. One includes the many papers sketching the evolution of the strategic management field that have been published in the last decade. The other group of papers has focused on the influence that journals have had on the discipline. We will try to present the main contributions of these papers and the gaps remaining in the literature.

In the first group, several studies have analyzed the evolution and development of strategic management as a scientific discipline using diverse quantitative techniques. Among the topics broached have been the definition of the discipline (Nag et al. 2007), its intellectual structure as based on the most influential articles (Ramos Rodriguez and Ruiz Navarro 2004; Furrer et al. 2008), the most outstanding authors (Nerur et al. 2008; Furrer et al. 2008), and the predominant research subfields (Furrer et al. 2008).

Especially interesting are the three papers related to the intellectual structure of the discipline, which are both similar and dissimilar in terms of: (1) unit of analysis, (2) methods, and (3) time frame. Ramos Rodriguez and Ruiz Navarro (2004) studied a period of 21 years—divided into 3 stages of 7 years each—of the scientific output of the *SMJ* (1980–2000) using the bibliometric co-citation analysis technique supported by the Multi-dimensional Scaling statistical method. The study determined the changes that had occurred within the discipline's intellectual structure, and the most outstanding authors in each stage.

The main conclusions it reached regarding the changes in the intellectual structure of the discipline can be highlighted as follows: (a) a marked importance of classic authors in the first stage, both those coming from organization theory and the pioneers in the teaching of strategy in business schools; (b) a progressive decrease in the influence of the classics; (c) relevance of the industrial economy as from the second stage, particularly starting with Porter (1980, 1985); and (d) the emergence and development of the resource-based view of the firm, which was the most influential contribution of the discipline in the third stage (Ramos Rodriguez and Ruiz Navarro 2004).

To complement the paper of Ramos Rodriguez and Ruiz Navarro (2004), Nerur et al. (2008) carried out a three-stage analysis of 21 years of scientific output of the *Strategic Management Journal (SMJ)* (1980–2000). Furrer et al. (2008) studied, in five stages, 26 years of scientific production of the *Academy of Management Journal*, the *Academy of Management Review*, the *Administrative Science Quarterly* and the *SMJ* (1980–2005). Furrer et al. (2008) examined articles on strategic management published in the *Academy of Management Journal*, the *Academy of Management Review* and the *Administrative Science Quarterly* (1980–2000) within a 21-year period, also for five stages. All these analyses were carried out from 1980 on, mainly conditioned by the emergence of the *SMJ* into the discipline.

All the above-mentioned studies have used the article or its key words as a unit of analysis for the study of the intellectual structure of strategic management, its evolution, and the most outstanding authors and their contributions to this discipline.

Although we have analyzed several aspects of the strategic management discipline, we have not yet found any study related to the development of the scientific community of the discipline. It thus seems to be necessary to analyze the evolution of the scientific community investigating strategic management throughout all its historical stages. The present paper is similar to the former investigations as regards the time frame and the use of the *SMJ* as one of the basic sources for studying the discipline. Nevertheless, it differs from the rest of the papers in terms of: (1) unit of analysis (countries) and (2) methods (social network analysis combined with co-word analysis).

In the second group of papers that have focused on the journals' influence over the discipline, noteworthy are the important contributions of Franke et al. (1990), Tahai and Meyer (1999), Phelan et al. (2002), Podsakoff et al. (2005), and Azar and Brock (2008).

Franke et al. (1990) show the evolution of strategic management, the connection between the degree of excellence of the journals and the impact of the articles associated with this field of research, and the correlation between quality measures of the current article impact and the cumulative journal influence. Tahai and Meyer (1999) performed another investigation based on the study of 17 management journals using citations compiled from 1993 to 1994. As a result, the *SMJ*'s leading role among the journals from the strategic management field was confirmed, and a new methodology that facilitated the ranking of the journals under examination was utilized.

Phelan et al. (2002) show the 20 years of progress and leadership of the *SMJ* in the creation, development, and dissemination of knowledge in this particular field, demonstrating the *SMJ*'s successful outcome within this period. Podsakoff et al. (2005) address the most influential journals within the management field. Their analysis of citations taken from 28 journals within a 20-year period found that the *Academy of Management Journal*, the *Academy of Management Review*, and the *Strategic Management Journal* were the journals with the highest growth rates. This finding places the *SMJ* among the top-quality journals in management worldwide.

Recently, Azar and Brock (2008) published an analysis regarding the ranking of strategic management journals based on the citation indices, which places the *Strategic Management Journal* in first place, followed by the *Journal of Economics & Management Strategy*.

All these studies include the same unit of analysis—journals—but follow different methods. Podsakoff et al. (2005) focus on management journals, whereas the other articles from this group focus on strategic management journals. The main difference between the present article and these from the second group are the unit of analysis and the methods used.

In the scientometrics field, Wagner and Leydesdorff (2005a, b) presented studies about the network structure in international cooperation in science. These authors mapped the collaboration using data from co-authorship at the international level of all fields of science in 1990 and 2000. Although we also use co-authorship to collect the information, in our study the structure of the network is visualized through the participation of authors from institutions of countries within a specific area of the management field: strategic management.

The present investigation is intended to define different standards for knowledge creation and diffusion within the strategic management field, and to discover knowledge production centers and patterns existing within inter-country cooperation during the global diffusion of knowledge regarding the strategic management theory. In addition, the study seeks to ascertain the significance level of inter-country cooperation for countries' development, concerning the generation and spreading of knowledge about the strategic management discipline.

Method

Unit of analysis

For this study, we use as unit of analysis the countries represented in the articles published in the *Strategic Management Journal* from 1980 to 2009, inclusive. To determine this unit, we considered the country to which the institution of the authors of each article is affiliated. Thus, the nationality of the authors was not taken into account as this information does not appear in the articles but rather that of the institution to which they belong.

Sample

All the articles published in the *Strategic Management Journal* from volume 1, issue 1, 1980 to volume 30, issue 13, 2009, comprise the sample. Editorial notes and book reviews were excluded. The *Strategic Management Journal* was chosen as a source for three main reasons: (1) it is the top journal on strategic management and one of the three best journals within the management field worldwide, according to the *Journal of Citation Reports* (JCR); (2) all the articles published in the *SMJ* refer directly to the strategic management discipline; (3) the *SMJ* has maintained stable growth in its impact factor for the last 4 years (*Journal Citation Reports. Social Sciences Citation Index*).

Time frame

The study covers a 30-year period, from 1980 to 2009. The scientific community of the strategic management discipline began to take shape around the early 1960s, whereas its scientific output started to be significant from 1980 on, along with the creation of the journal of reference on strategic management, the *SMJ*. Thus, our period was selected based on consideration of the origin of the source of information, that is, 1980. This period was then stratified into three stages of ten years each: (1) from 1980 to 1989, (2) from 1990 to 1999, and (3) from 2000 to 2009. The 10-year lapse is considered adequate since it represents an important period in which the growth and maturity phases of the academic community took place.

Processing

Processing consists of three steps: (1) data collection, (2) creation of the network for each stage, and (3) analysis through network analysis techniques combined with co-word techniques.

Step 1: gathering and coding of information

To gather the information, it was necessary to review all the articles published during the period covered by the study. The number of authors from each country per article for the 10 years making up every stage was counted. To code the annual information, the number of authors per article was quantified and the country of origin was assigned 1 point for each participating author. In the case of articles coauthored by authors from two or more countries, each represented country was assigned 1 point per author. In cases where the author declares more than one country of origin, we took the first country declared. We used this method to avoid the problems described by Katz (1994) for counting institutional

collaboration when using fractionates of each publication with the $1/n$ th method. For the assessment of the information belonging to each country, we only took into account the country alleged by the author of the article. As the data from the *Social Science Citation Index* does not provide information on individual author–institution affiliations, we gathered the information directly by reviewing each of the articles published in the period studied.

The process for gathering the information concerning the relationship among countries as regards knowledge creation and dissemination through the *SMJ* involves two steps. First, all the articles were coded with a number corresponding to volume, issue and the number of the article in this issue. Thus, for example, 010101 would correspond to the first article published in issue one, volume one of the *SMJ*. Also, we identified each of the articles with the first author's name. This avoids data entry errors and standardizes codes for each article.

The next step was to create a publication matrix (article \times country). After this step, many authors make a co-occurrence matrix, as in Katz (1994), or they symmetrize the matrix (two modes to one mode) using indices such as cosine, Jaccar, proximity, inclusion or the Pearson's correlation coefficient (Wagner and Leydesdorff 2005a). In the present study, we preferred to use the frequencies of each country and its relations to create the networks for each stage directly in Pajek (Batagelj and Mrvar 1998), Pajek is a software package for social network analysis and visualization which is freely available for academic usage at <http://vlado.fmf.uni-lj.si/pub/networks/pajek/>, situating the number of authors of each country as a vector value, and the amount of international articles co-authored as the values of lines between each two countries involved. In a further step, we remove the effect of institutional size, in this case derived from the predominance of the United States strategic management scientific community using the centrality degree. This step replaces the normalization that traditionally is done by the cosine, Jaccar or other many methods, and it reduces the difficulty reported by Peters and Raan (1993a, b) in their study.

Step 2: creation of the network for each stage

To create the network, social network analysis and co-word analysis (Leydesdorff 1997) techniques were used. In the business management field, social network analysis has been used and developed by Burt (2001, 2007, 2008). It has also been used in works related to strategic alliances (Gulati 1998; Gulati et al. 2000; Zajac 1998; Kogut 2000). To analyze the results in every stage, the following steps were performed:

- Creation of a random network using the Pajek software with countries that are represented by authors whose articles were published in the *SMJ* in each one of the analyzed phases.
- Making of a partition to name each vertex forming the network structure in every stage after the names of the countries.
- Creation of a constant vector to locate data for values corresponding to the amount of authors from a certain country who published articles in each stage.
- Assignment of line values. The link between each pair of vertices (countries) is drawn as a line that connects the two vertices (countries). In the network, each line value represents the amount of cooperation or co-authorship of authors from institutions of two or more countries. To code each line value between vertices (countries) we use the method of two-way collaboration developed by Katz (1994). For example, a paper listing four universities A, B, C and D would be counted as having six two-way

collaborations A–B, A–C, A–D, B–C, B–D and C–D. So the formula would be $c = [n(n/1)]/2$ (Katz 1994, p. 35).

Step 3: analysis of information

Data from the previous step serve to perform the network analysis per stage. The analysis consists of 3 phases.

Calculation of the centrality degree of each country In certain studies for mapping the structure to explore collaborative activity by investigating co-authorship linkages, authors use multidimensional scaling, which sometimes tends to be a distorting method (Peters and Raan 1993a,b; Katz 1994). In this research, we have used Social Network Analysis techniques to map the structure of the network for each stage. We have selected this technique for two main reasons: (1) it allows us to determine the indices of the network, such as density, centralization, clusterability, and connectedness, which will help to establish the network evolution from one stage to the next; and (2) we do not need to normalize the data, and thus avoid losing some information in the process.

Once the network for each stage was built, we used social network analysis techniques to determine the centrality degree of each country that participated in the network. Based on this information we then traced the evolution of the structure of the strategic management scientific community through the three stages studied. The measure of centrality is understood as a set of algorithms calculated in each network. It enables us to know the position of the vertex inside the network, as well as its structure (De Nooy et al. 2005).

In order subsequently to analyze the results obtained, we carried out two types of actions. First, the location of the countries in the structure of the network. Given that the centrality degree values obtained for each country lie within a range of 0.00 to 1.00, this range was stratified into three segments or thresholds. In the first threshold are located the countries that pertain to the network periphery, with centrality degree values between 0.00 and 0.33. The countries pertaining to the network semi-periphery are located in the second threshold, with centrality degree values between 0.34 and 0.67. Finally, the third threshold includes the countries that belong to the core of the network, and have centrality degree values between 0.68 and 1.00. Second, once each country was located in the corresponding threshold according to its centrality degree, its evolution was traced in relation to the changes in position it undergoes throughout the stages being studied. The results of the centrality analysis are represented graphically using the Pajek software package (Batagelj and Mrvar 1998). We used the vector command of Pajek, and partition was done by intervals selecting “selected thresholds” and then energized using the Kamada Kawai technique (Kamada and Kawai 1989).

Determination of a country’s development during each stage Given the information of each country per stage, emission and reception rates for each country on the network were created and estimated in order to ascertain their progress per stage. The emission rate was calculated as the quotient resulting from the number of authors belonging to the issuing country who published articles as co-authors divided into the total number of authors from this country who published articles in the *SMJ* in the analyzed stage. The reception rate was computed as the quotient of the number of authors from the recipient country who published articles as co-authors divided into the total number of authors from this same country who published articles in the *SMJ* during the stage under examination.

The developmental stages for each country were defined from the estimation of the emission and reception rates, the location of countries on the different layers or positions of

Table 1 Evolutionary stages for the development of the network on knowledge creation in the strategic management field

Stage	Characteristics
Inclusion/formation	<ul style="list-style-type: none"> –Many vertices appear in isolation. –Prevalence of a vertex. –Appearance of the core, and periphery positions. –The relationship goes from the core to the periphery. –Low density and connectedness levels of the network –The reception index prevails over the emission index.
Consolidation/ dissemination	<ul style="list-style-type: none"> –Inclusion of new vertices. –Beginning of development of vertices on the periphery. –Transition of some vertices from the periphery to the semi-periphery. –Increase of links between the core and the periphery. –First display of links between the vertices on the semi-periphery and the ones at the periphery. –Increase in the density and connectedness levels of the network. –The reception index prevails over the emission index. –Vertices became nodes.
Expansion/transformation	<ul style="list-style-type: none"> –Stable growth of vertices in the network. –Nodes turn into hubs, and the emission indices exceed the reception indices. –Definition of vertices on the semi-periphery and the periphery. –Increase in the relations among vertices on the semi-periphery. –Presence of links among vertices on the periphery.

the network, and the characteristics and patterns observed in each of the following stages: (1) inclusion/formation, (2) consolidation/dissemination, and (3) expansion/transformation (see Table 1).

Determination of network evolution for each stage The comparison of two networks N_1 and N_2 , which might be two networks at different times or two networks at the same time, can be made using the method developed by Callon et al. (1991) and He (1999). To study the evolution of the network of the scientific community around the *SMJ* for each stage, two steps were performed: (1) establishing the density and centrality rates of the network; and (2) identifying the dissimilarity index. Density shows the number of lines in a network and the internal consistency or strength of relationships between members of the network. The density is calculated by dividing the total number of existing relations by the total of possible relations.

The connectedness index indicates the number of connections within the network taking into account the number of possible relations. A complete network exists when all the vertices that make it up are interconnected, that is, there are no vertices in isolation.

Comparison of the networks obtained during the three periods studied was made using the three-step method proposed by Callon et al. (1991), which is adjusted to networks integrated by countries. Comparison of two networks at different times was performed by calculating the index of dissimilarity (Callon et al. 1991). This index is defined as: $t = \frac{(W_i + W_j)}{W_{ij}}$, where W_i is the number of countries in cluster C_i ; W_j is the number of countries in cluster C_j ; and W_{ij} is the number of countries common to C_i and C_j .

Network transformation and intersection with other networks across time periods provides evidence of the emergence of research communities. In addition, in order to determine the development of the countries within the network structure we use three levels: vertex, node and hub (Wagner and Leydesdorff 2005b). A vertex is the smallest piece of the network structure. The node is defined as a vertex to which other vertices are connected, and a hub is a node well connected to other nodes and/or vertices.

Determination of the influence of cooperation for the development of the scientific community around the SMJ Scientific collaboration is a social process and probably there are as many reasons for researchers to collaborate as there are reasons for people to communicate (Katz 1994). A scientific document is coauthored if it has more than one author, and it is internationally coauthored if at least two of the authors come from two different countries (Wagner and Leydesdorff 2005a). These authors defined international collaboration in science as a communication network that is different from national systems and has its own internal dynamics (Wagner and Leydesdorff 2005b).

For the present research, we use the term cooperation as a synonym of collaboration and it is defined as the association of one or many authors from institutions in one country (intra-national) or from institutions of many countries (international) sharing goals and working together towards a common objective. We have defined country–country cooperation based on Katz's (1994) definition of university–university collaboration. Thus, we define country–country cooperation as any article published in the *SMJ* in which two or more country names appear declared by its authors. The cooperation could be among authors from different institutions of a same country (intra-national) or from institutions of two or more countries (international).

This step was performed by comparing the results of countries with sustained growth, which, in turn, increased their cooperation with the country in the core of the network, to the results of countries with growing rates but little cooperation with the country in the core of the network. Finally, the significance level of the countries' transformation was ascertained by using the *t*-test for the assessment of changes.

Analysis and discussion of results

Between 1980 and 1987 (volumes 1–8), 4 issues per year were published in the *SMJ*. This is the stage in which the first special issues were published that were devoted to specific development subjects within the discipline. Starting in 1988, the number of annual issues grew from 4 to reach 7 in 1990. Between 1991 and 1995, 8 issues per year were published, and in 1999, publications stabilized as 12 regular issues and 2 special issues per year. The gradual increase in the number of annual issues favored the increase in the insertion of authors from several countries, which resulted in the construction of a scientific community network around the articles published in the *SMJ*. All this proves that the journal has turned into a specialized resource for the generation, development and diffusion of knowledge about the strategic management discipline. Similarly, it has become the appropriate link for creating and broadening the network of researchers within the scientific community of the discipline.

The quality of publications in the *SMJ* has increased continuously. This is confirmed by the enhancement of the impact factor (see Fig. 1) of the *SMJ* and its ranking among journals on management.

Between 1980 and 2009, 3,145 authors from 38 countries published articles in the *SMJ*: 72.9% of authors were from the USA, 5.88% from the United Kingdom, 4.36% from

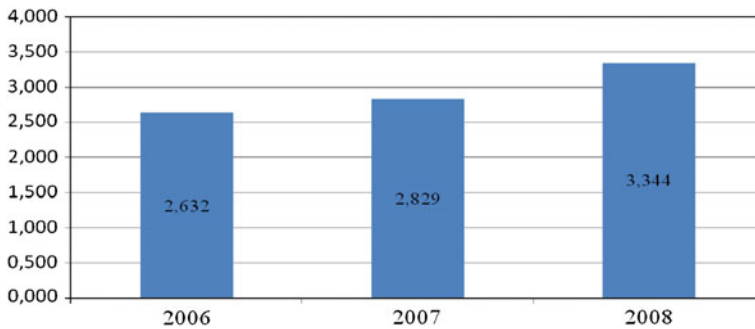


Fig. 1 Evolution of the impact factor of the SMJ. Source: *Journal of Citation Report—Social Sciences Citation Index*

Canada, and 3.59% from France, 1.37% from Hong Kong, 1.30% from Spain and 1.08% from the Netherlands. The participation of authors from the remaining 31 countries was less than 1% each.

Of the 1,616 articles published during the three stages, 32.24% were published by only one author. This trend decreases steadily over the two last stages. Thus, in the stage 1980–1989 the percentage of articles published by one author was 49.08%, in the stage 1990–1999 this percentage decreased to 33.05%, and in the stage 2000–2009 it decreased to 23.76%. This result shows that the articles produced in co-authorship increased continuously over time from one stage to the next.

Stage I started with the participation of 18 countries headed by authors from the USA. In the second stage, 12 new countries were incorporated into the network, and 4 that had participated in the first stage do not appear in the second one. This result shows a net growth rate of 44.44%, and the participation of 26 countries. In the third stage, 34 countries form the network for a growth rate of 30.77%. Whereas 11 new countries became incorporated into the network, 3 countries from the previous stage left it (Table 2).

Figure 2 shows the progressive inclusion of countries into the network of the scientific community on strategic management around the *SMJ*. In the first decade there were 18 countries, representing 47.36% of the entire network; the second decade included 26, which represented 68.42% of the whole network; and in the third decade, 34 countries participated, representing 89.47% of the entire network. These data indicate a steady growth in the number of countries admitted into the strategic management scientific community.

Throughout the three stages, cooperation among authors from different countries intensified continually. This relationship initially consisted of authors belonging to the leading country cooperating with authors from countries on the periphery of the network. This trend allowed the network to expand by the insertion of authors from institutions of new countries into the scientific community conducting research in the strategic management field. All this favors the spreading of knowledge that is gradually absorbed by all countries worldwide.

Stage I: 1980–1989

In the first stage, 525 authors—74.48% of them from American universities—coming from 18 countries published articles in the *SMJ*. This trend mainly follows the maturation process of the strategic management community in the US, which started to work on the creation of new concepts regarding the discipline in the early 1960s.

Table 2 Descriptive statistics for each stage

Countries	Stage I		Stage II		Stage III		TOTAL	
	No. of authors	%	No. of authors	%	No. of authors	%	Total	%
Argentina	0	0.00	0	0.00	1	0.07	1	0.03
Australia	0	0.00	3	0.27	13	0.87	16	0.51
Austria	0	0.00	0	0.00	3	0.20	3	0.10
Belgium	3	0.57	5	0.45	7	0.47	15	0.48
Brazil	0	0.00	0	0.00	2	0.13	2	0.06
Canada	36	6.86	35	3.12	66	4.41	137	4.36
Chile	0	0.00	2	0.18	0	0.00	2	0.06
China	0	0.00	1	0.09	10	0.67	11	0.35
Cyprus	0	0.00	0	0.00	3	0.20	3	0.10
Denmark	0	0.00	0	0.00	11	0.73	11	0.35
Finland	1	0.19	0	0.00	14	0.93	15	0.48
France	19	3.62	43	3.83	51	3.40	113	3.59
Germany	1	0.19	7	0.62	15	1.00	23	0.73
Greece	0	0.00	1	0.09	3	0.20	4	0.13
Hong Kong	0	0.00	6	0.53	37	2.47	43	1.37
India	0	0.00	1	0.09	1	0.07	2	0.06
Indonesia	0	0.00	1	0.09	0	0.00	1	0.03
Ireland	2	0.38	1	0.09	0	0.00	3	0.10
Israel	6	1.14	11	0.98	5	0.33	22	0.70
Italy	0	0.00	2	0.18	8	0.53	10	0.32
Japan	1	0.19	6	0.53	14	0.93	21	0.67
Korea	0	0.00	3	0.27	21	1.40	24	0.76
Macau	0	0.00	0	0.00	2	0.13	2	0.06
New Zealand	1	0.19	5	0.45	3	0.20	9	0.29
Norway	0	0.00	8	0.71	6	0.40	14	0.45
Portugal	1	0.19	0	0.00	4	0.27	5	0.16
Russia	0	0.00	0	0.00	1	0.07	1	0.03
Singapore	0	0.00	2	0.18	22	1.47	24	0.76
South Africa	1	0.19	0	0.00	0	0.00	1	0.03
Spain	3	0.57	4	0.36	34	2.27	41	1.30
Sweden	1	0.19	10	0.89	16	1.07	27	0.86
Switzerland	2	0.38	4	0.36	9	0.60	15	0.48
Taiwan	0	0.00	1	0.09	3	0.20	4	0.13
The Netherlands	6	1.14	17	1.52	11	0.73	34	1.08
Turkey	3	0.57	0	0.00	1	0.07	4	0.13
United Arab Emirates	0	0.00	0	0.00	4	0.27	4	0.13
United Kingdom	47	8.95	68	6.06	70	4.67	185	5.88
USA	391	74.48	875	77.99	1,027	68.56	2,293	72.91
Total	525	100.00	1,122	100.00	1,498	100.00	3,145	100.00

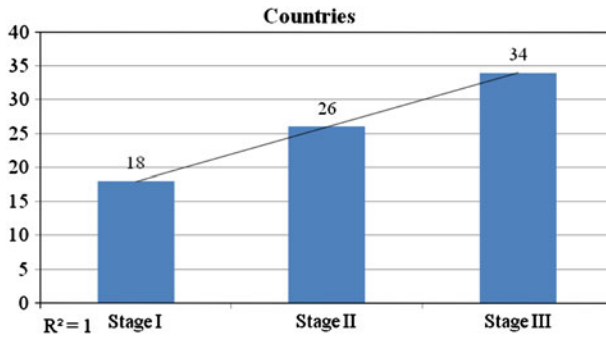


Fig. 2 Evolution of the insertion of countries into the network of the strategic management scientific community

From the very beginning, the leading position of authors from American institutions placed this scientific community at the center of the network. In this stage, the network density and connectedness values were 0.09 and 5.86, respectively; 50.00% of the included countries appear isolated in the network. This arrangement shows that, initially, cooperation flows among authors from universities in the same country (intra-cooperation), mainly from universities of the country located in the leading position of the network, favor the endogenous development of the scientific community of that country, which is a typical element in the formation phase of a school of thought on research. In this stage, the USA is located in the semi-periphery of the network and the rest of the countries in the periphery zone.

Throughout this stage, only 22 articles were published by means of cooperative links between different countries (inter-cooperation): 16 by authors from American universities (72.72%), and 4 by authors from the United Kingdom, 1 from Canada and 1 from France. This result shows that the pattern affecting the direction of the cooperation relationship mainly goes from the country in the semi-periphery zone to those on the periphery (see Fig. 3).

Stage II: 1990–1999

In this stage, 1,122 authors from institutions of 26 countries participated in the network (77.89% from American universities). This growth placed the USA in the core of the network. The profusion of the total number of authors in this stage is due to the increase in the number of issues of the *SMJ* per volume. Density and connectedness levels grew from 0.09 to 0.12 and from 3.81 to 8.35, respectively. This growth took place because the countries in isolation decreased from 9 to 3, and the number of articles published with the cooperation of two or more countries grew.

Once relationship standards move from the country in the core of the network, cooperation begins to spread out, with some evidence of a relationship between authors from countries on the periphery. In addition, 77 articles were published under cooperation between two or more countries, which stands for a 71.5% increase over the former stage, and 78.94% of the articles were issued with the contribution of authors from institutions in the USA. Thus, the cooperation level remains similar to that of the previous stage.

Within this stage, articles published in the *SMJ* under the cooperation of countries on the periphery grew from 5 to 15. The United Kingdom ranks above other countries;

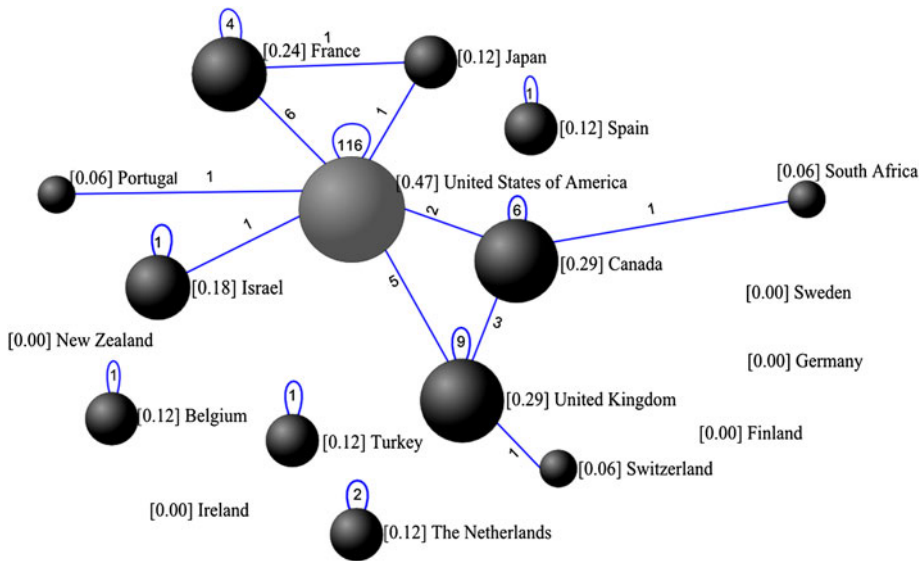


Fig. 3 Structure of the scientific community of the strategic management discipline (Stage I). *Note:* Color change is associated with the zone of the network. *Light gray* = core; *dark gray* = periphery. Values in loops signify the intra-cooperation

Canada, France, and the Netherlands grow. This result proves that the network structure in this stage comprises two areas (core and periphery): the USA in the core, and the rest of the countries on the periphery. All these elements indicate that the network has evolved from the formation phase to the consolidation phase. Consequently, the scientific output from other countries is widely spread out. The predominant pattern indicating the direction of the relationship between the core and the periphery remains stable, and the relations between countries in the periphery begin (see Fig. 4).

Stage III: 2000–2009

In this stage, 1,498 authors from 34 countries—mainly, as in former stages, from universities in the USA (68.56% of the total of participating authors). Authors from 11 countries were admitted in this stage, causing a 30.76% increase in the network in contrast to the previous stage. In addition, the *SMJ* stabilizes publications to one regular issue per month and two special issues per volume. The presence of countries on the periphery is unstable.

This stage serves as a platform for the definition of patterns, showing that only 34.21% of the network maintained a stable participation of countries throughout the three stages. That is, authors from 13 countries published articles in all the three stages. These countries are: Belgium, Canada, France, Germany, Israel, Japan, New Zealand, Spain, Sweden, Switzerland, the Netherlands, the United Kingdom, and the United States of America. The rest appeared and vanished in one stage or the other indistinctly. In addition, the network density increased from 0.12 to 0.14, and the connectedness grew from 9.70 to 13.83. Three countries appear in isolation in the network, representing 8.82% of the network, and a decrease of 2.71% in relation to the previous stage.

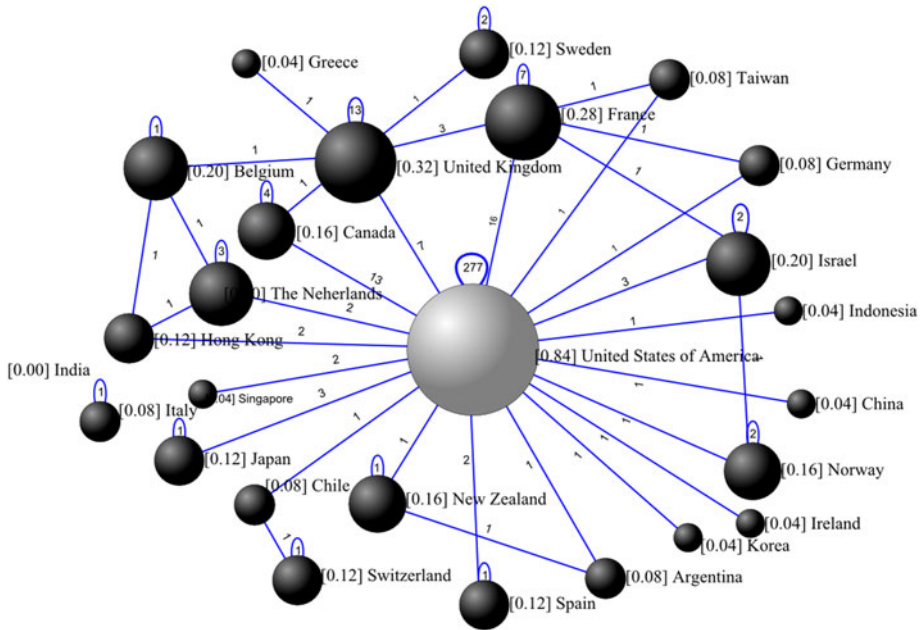


Fig. 4 Structure of the scientific community of the strategic management discipline (Stage II)

In comparison to the second and first stages, the number of articles published under cooperation of two or more countries (167) in the current period increased by 54.51% and 629.09%, respectively: 73.61% of the articles were published in co-authorship with authors from universities in the USA, 11.81% with authors from the United Kingdom, and 4.86% with authors from Canada. The USA's position in the core of the network is reaffirmed. The United Kingdom's position on the semi-periphery is reaffirmed, and it has turned into a hub and evolved into a sub-network of the main network, whereas Canada and France strengthen their position on the semi-periphery, begin to form sub-networks adjacent to them and begin their evolution into hubs (see Fig. 5).

As has been shown, the stable development throughout the three stages favored the inclusion of authors from new countries. It also favored an increase in the amount of authors from a same admitted country who contributed to the formation, consolidation and diffusion of notions on the strategic management theory, plus the creation of a global school of thought on strategic management.

In this stage, the constitution of the three thresholds that make up the network's structure—core, semi-periphery, and periphery—begins to be defined. The United States of America places in the core of the network, Canada, France and United Kingdom in the semi-periphery, and the rest of the countries in the periphery area of the network.

Results gathered from the present study demonstrate that the dynamics of the evolution of the network regarding the generation and dissemination of knowledge on strategic management involves two main factors: (1) the formation and evolution of a vertex's position in the network, and (2) the evolutionary stage of the whole network.

Referring to the position of each vertex, the data show that, first, the core position, dominated by the scientific community of the USA, clearly stands out, whereas the United Kingdom, Canada and France are represented on the periphery of the network to a lesser

Table 3 Centrality degree of countries for each stage

Countries	Centrality degree		
	Stage I	Stage II	Stage III
Argentina	–	–	0.03
Australia	–	–	0.09
Austria	–	–	0.06
Belgium	0.12	0.20	0.21
Brazil	–	–	0.03
Canada	0.29	0.16	0.45
Chile	–	0.08	–
China	–	0.04	0.21
Cyprus	–	–	0.09
Denmark	–	–	0.24
Finland	0.00	–	0.15
France	0.24	0.28	0.39
Germany	0.00	0.08	0.24
Greece	–	0.04	0.03
Hong Kong	–	0.12	0.24
India	–	0.00	0.06
Indonesia	–	0.04	–
Ireland	0.00	0.04	–
Israel	0.18	0.20	0.09
Italy	–	0.08	0.12
Japan	0.12	0.12	0.15
Korea	–	0.04	0.21
Macau	–	–	0.09
New Zealand	0.00	0.16	0.03
Norway	–	0.16	0.12
Portugal	0.06	–	0.06
Russia	–	–	0.03
Singapore	–	0.04	0.15
South Africa	0.06	–	–
Spain	0.12	0.12	0.15
Sweden	0.00	0.12	0.18
Switzerland	0.06	0.12	0.12
Taiwan	–	0.08	0.03
The Netherlands	0.12	0.20	0.24
Turkey	0.12	–	0.00
United Arab Emirates	–	–	0.12
United Kingdom	0.29	0.32	0.42
USA	0.47	0.84	0.76

Because of the significant increase in the centrality degree obtained by Canada, France and the United Kingdom in the third stage, the structure of the network describes three areas: periphery, semi-periphery, and core (Figs. 3, 4 and 5).

In the first stage of the network structure, 4 nodes are visible (United States of America, United Kingdom, France, and Canada) and the rest of the countries act as vertices (Fig. 3). In the second stage, the United States and the United Kingdom evolved from nodes into hubs, and Belgium, Germany, Hong Kong, Israel, the Netherlands, New Zealand and Norway evolved from vertices to nodes in the structure of the network (Fig. 4). In the third stage, France and Canada evolved into hubs, the United Kingdom gained reputation and began to add followers, creating a sub-network incident to it. China, Denmark, Japan, Korea, Spain, and Switzerland evolved into nodes. Israel, which in the second stage was a node, returned to being a vertex in this stage (Fig. 5).

Network's development during each stage

Table 4 shows the indices of density, connectedness, centralization, emission and reception rates of the network during the three stages. As can be observed, all the indices increased their values during the three stages. This means that the structure of the network has evolved steadily over the three stages.

In Table 5 the emission and reception rates of each country are described. The solid position of the US in the core of the network during the expansion phase is confirmed by the stable growth of the emission rate throughout all the stages. Similarly, the US played a key role in the evolution and extent of the network structure and in the actors' transformation at different positions of the network.

The United Kingdom, positioned on the semi-periphery, evolved as well and turned into a hub, contributing to the network expansion by the introduction of authors from new countries, which places it in the expansion stage of the network. Consequently, the emission index outgrew the reception in the third stage. France also showed a steady development of the emission index, as well as an increase in the prevalent figures of the reception rate. These countries placed on the semi-periphery and within the consolidation/dissemination stage. The rest of the countries display a reception index considerably greater than the emission one, which places them on the periphery and within the incorporation/formation stage.

On the one hand, all these patterns denote a continuous trend towards the transformation of the vertices into hubs and their subsequent conversion into knowledge generators and diffusers. Afterwards, they change from the semi-periphery to the periphery position and the countries on the periphery change down to the semi-periphery, which illustrates the dynamic evolution of the world scientific community network around the production and diffusion of notions on strategic management worldwide. On the other hand, it can be seen that authors from American universities have played a leading role in the evolution and expansion of the network of the scientific community regarding articles published in the *SMJ*.

Table 4 Indices of the network for each stage

Stages	No. of countries	Density	Connectedness	Centralization	Reception index	Emission index
Stage I	18	0.09	5.86	2.11	0.10	0.12
Stage II	26	0.12	9.70	3.61	0.10	0.14
Stage III	34	0.14	13.83	5.47	0.39	0.48

Table 5 Emission–reception indices for network cooperation

Countries	Authors per stage			Emission rate			Reception rate		
	Stage I	Stage II	Stage III	Stage I	Stage II	Stage III	Stage I	Stage II	Stage III
	Argentina	0	0	1	0	0	0	0	0
Australia	0	3	13	0	0	0	0	0.33	0.07
Austria	0	0	3	0	0	0	0	0	0
Belgium	3	5	7	0	0	0	0	0.4	0.42
Brazil	0	0	2	0	0	0	0	0.4	0.50
Canada	36	35	66	0.02	0	0.21	0.13	0.4	0.36
Chile	0	2	0	0	0	0	0	1	0
China	0	1	10	0	0	0.10	0	1	0.40
Cyprus	0	0	3	0	0	0	0	0	0.33
Denmark	0	0	11	0	0	0.27	0	0	0.45
Finland	1	0	14	0	0	0	0	0	0.42
France	19	43	51	0.05	0.06	0.19	0.47	0.44	0.45
Germany	1	7	15	0	0	0.13	0	0.28	0.20
Greece	0	1	3	0	0	0	0	1	0.33
Hong Kong	0	6	37	0	0	0.18	0	0.50	0.10
India	0	1	1	0	0	0	0	0	0
Indonesia	0	1	0	0	0	0	0	1	0
Ireland	2	1	0	0	0	0	0	1	0
Israel	6	11	5	0	0.09	0	0.16	0.27	0.10
Italy	0	2	8	0	0	0	0	0	0.25
Japan	1	6	14	0	0	0	0.50	0.50	0.64
Korea	0	3	21	0	0	0.09	0.33	0.33	0.23
Macau	0	0	2	0	0	0	0	0	1
New Zealand	1	5	3	0	0.20	0	0	0.20	0.33

Table 5 continued

Countries	Authors per stage			Emission rate			Reception rate		
	Stage I	Stage II	Stage III	Stage I	Stage II	Stage III	Stage I	Stage II	Stage III
	Norway	0	8	6	0	0	0	0	0.12
Portugal	1	0	4	0	0	0	1	0	0
Russia	0	0	1	0	0	0	0	1	1
Singapore	0	2	22	0	0	0	0	1	0.68
South Africa	1	0	0	0	0	0	1	0	0
Spain	3	4	34	0	0	0	0	0.33	0.28
Sweden	1	10	16	0	0	0.06	0	0.10	0.18
Switzerland	2	4	9	0	0.25	0.11	1	0	0.55
Taiwan	0	1	3	0	0	0	0	1	0
The Netherlands	6	17	11	0	0.11	0	0	0.11	0
Turkey	3	0	1	0	0	0	0	0	0
United Arab Emirates	0	0	4	0	0	0.25	0	0	0.25
United Kingdom	47	68	70	0.08	0.08	0.15	0.10	0.10	0.14
United States America	391	875	1.027	0.04	0.06	0.08	0	0	0

Evolution of the scientific community network

In the previous sections, the process of the creation, consolidation, and transformation of vertices within the network structure around the scientific community of the strategic management field was disentangled. In order to appraise the transformation of the network of countries according to each stage, Coultier et al. (1998) dissimilarity indices were used (Table 6).

Computation of these indices shows that the network of countries around the generation of knowledge on strategic management increased in the first and second stages and decreased in the third. This result matches the progress of the number of authors admitted in the second stage due to the publishing of more numbers of the *SMJ* from 1988 on. In the third stage, the dissimilarity index maintains the same value as in the first stage. This is because of the fluctuation of countries moving in and out of the network structure. Thus, the *SMJ* holds the leading position in both network creation and transformation.

Importance of cooperation among authors in the core of the network for the inclusion and development of new countries

Throughout the mentioned stages, the inclusion of countries into the network favored an increase of the amount of authors from these countries. Likewise, the growth in the emission indices made it possible for a vertex to change from vertex to node and from node to hub, as well as to move from the semi-periphery to the periphery position (i.e. United Kingdom), and vice versa (e.g. Canada, France and Sweden). Now we must estimate whether the evolution was caused by the development of cooperation levels or by chance.

The cooperation in the scientific strategic management community evinced two dimensions. The first dimension deals with cooperation among authors coming from institutions of a same country (829 articles), and the second dimension represents cooperation among authors from two or more countries: 245 from 2 countries, 20 with 3 countries, and 1 with the participation of authors from 4 countries (Table 5). As can be seen in Table 7, in both dimensions cooperation grew significantly. Nevertheless, cooperation among authors from institutions in the same country prevailed in the three analyzed stages.

Table 6 Evolution of the network of authors

	Dissimilarity index	
	Stage II	Stage III
Stage I	0.30	0.38
Stage II		0.30

Table 7 Descriptive statistics of cooperation among authors

	Articles	Authors	Authors/ Article	Total	%	1 Country	2 Countries	3 Countries	4 Countries	Total
Stage I	326	525	1.61	166	50.92	144	21	1	0	166
Stage II	587	1,122	1.91	393	66.95	316	73	4	0	393
Stage III	703	1,498	2.13	536	76.24	369	151	15	1	536
Total	1,616	3,145	1.95	1,095	67.76	829	245	20	1	1,095

The patterns of cooperation during the three stages reveal that the countries placed in the semi-periphery area of the network have a higher percentage of cooperation among authors from their institutions than the countries located in the periphery of the network. This favored the growth in the number of authors from those countries that published articles in the *SMJ*.

Figure 6 shows that although there are notably more articles co-authored among authors from institutions of the same country than articles published with the co-authorship of authors from two or more countries, both increased at the same time. This means that inter-country cooperation grew significantly over the three stages.

The number of nationally coauthored publications has grown linearly ($r^2 = 0.9147$), and internationally coauthored publications have grown exponentially ($r^2 = 1$). The sustained growth in the number of articles by internationally collaborating authors suggests that the growth of the network extends to many more countries around the strategic management scientific community, with a corresponding growth in the possibility of knowledge diffusion. The average number of articles in any one internationally coauthored publication has grown from an average of 166 in 1990, 393 in 2000 to 536 in 2009, and this trend is accelerating. This result is similar to the one reported by Wagner and Leydesdorff (2005b) for international collaboration in science and the formation of core groups.

Table 8 displays the descriptive statistics regarding cooperation among authors from institutions of the same country. As can be seen, five trends or patterns exist. The first group comprises the countries whose amount of intra-cooperation increased steadily over the three stages. Canada, Italy, Japan, Spain, Sweden, the United Kingdom and the United States of America are included in this trend.

The second group contains those countries which had a certain amount of intra-cooperation in the first two stages that then increased in the third stage. Within this trend we have Australia, Belgium, Germany, Korea, Norway and Turkey. The third group consists of the countries that began in the first stage with a certain level of cooperation, which

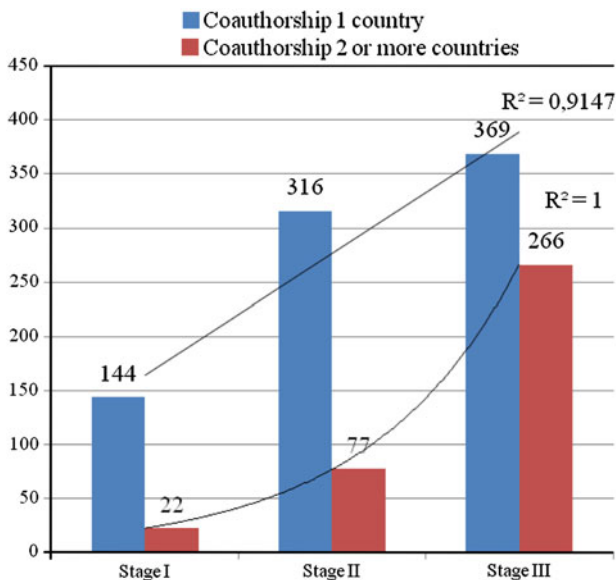


Fig. 6 Trends in the co-authorship of articles in the *SMJ* 1980/2009

Table 8 Descriptive statistics of cooperation among authors in one country

Countries	Stage I		Stage II		Stage III		Total	
	Total	%	Total	%	Total	%	Total	%
Argentina	0	0.00	0	0.00	0	0.00	0	0.00
Australia	0	0.00	0	0.00	3	0.81	3	0.36
Austria	0	0.00	0	0.00	1	0.27	1	0.12
Belgium	1	0.69	1	0.32	1	0.27	3	0.36
Brazil	0	0.00	0	0.00	0	0.00	0	0.00
Canada	9	6.25	4	1.27	8	2.17	21	2.53
Chile	0	0.00	0	0.00	0	0.00	0	0.00
China	0	0.00	0	0.00	1	0.27	1	0.12
Cyprus	0	0.00	0	0.00	1	0.27	1	0.12
Denmark	0	0.00	0	0.00	2	0.54	2	0.24
Finland	0	0.00	0	0.00	2	0.54	2	0.24
France	4	2.78	7	2.22	4	1.08	15	1.81
Germany	0	0.00	0	0.00	3	0.81	3	0.36
Greece	0	0.00	0	0.00	0	0.00	0	0.00
Hong Kong	0	0.00	0	0.00	2	0.54	2	0.24
India	0	0.00	0	0.00	0	0.00	0	0.00
Indonesia	0	0.00	0	0.00	0	0.00	0	0.00
Ireland	0	0.00	0	0.00	0	0.00	0	0.00
Israel	1	0.69	2	0.63	1	0.27	4	0.48
Italy	0	0.00	1	0.32	2	0.54	3	0.36
Japan	0	0.00	1	0.32	2	0.54	3	0.36
Korea	0	0.00	0	0.00	3	0.81	3	0.36
Macau	0	0.00	0	0.00	0	0.00	0	0.00
New Zealand	0	0.00	1	0.32	0	0.00	1	0.12
Norway	0	0.00	2	0.63	2	0.54	4	0.48
Portugal	0	0.00	0	0.00	2	0.54	2	0.24
Russia	0	0.00	0	0.00	0	0.00	0	0.00
Singapore	0	0.00	0	0.00	1	0.27	1	0.12
South Africa	0	0.00	0	0.00	0	0.00	0	0.00
Spain	1	0.69	1	0.32	10	2.71	12	1.45
Sweden	0	0.00	2	0.63	4	1.08	6	0.72
Switzerland	0	0.00	1	0.32	0	0.00	1	0.12
Taiwan	0	0.00	0	0.00	0	0.00	0	0.00
The Netherlands	2	1.39	3	0.95	1	0.27	6	0.72
Turkey	1	0.69	0	0.00	0	0.00	1	0.12
United Arab Emirates	0	0.00	0	0.00	1	0.27	1	0.12
United Kingdom	9	6.25	13	4.11	14	3.79	36	4.34
USA	116	80.56	277	87.66	298	80.76	691	83.35
Total	144	100.00	316	100.00	369	100.00	829	100.00

decreased in the second stage and then increased again in the third stage. Here we can find France, Israel, New Zealand, and the Netherlands. In the fourth group are the countries that began with a certain amount of intra-cooperation in the first stage, which increased in the second stage, and was maintained in the third stage. In this position, we have Austria, China, Cyprus, Denmark, Finland, Hong Kong, Portugal, Singapore and United Arab Emirates. Finally, the fifth group encompasses the countries that have no intra-cooperation during the three stages. Here we can find Argentina, Brazil, Chile, Greece, Indonesia, Ireland, Macau, Russia, South Africa and Taiwan.

Despite the sustained increase in the number of articles published by means of cooperation over the three stages, the data show that cooperation could be more significant for those countries that increase at the same time: (a) the number of articles published in the *SMJ*; and (b) the number of authors that cooperated with authors from the country in the core area of the network.

Also of interest is to see how the countries in the semi-periphery and periphery have developed over time through the three stages. To do this, we assessed the significance of cooperation between authors from the country in the core position, and those from the semi-periphery, and periphery, comparing the following variables: (1) number of articles published in cooperation with authors from the country in the core of the network; (2) number of authors concurring with the inter-country cooperation at other positions of the network. To select the countries for the statistical test of significance, two criteria were taken into consideration: (1) the country should appear in the three stages analyzed, (2) the country has a sustained increase in the number of articles published in the *SMJ*.

For the first group of the statistical test, we chose the three countries—Canada, France and the United Kingdom—that had an increase in the amount of researchers who published articles in the *SMJ* in cooperation with authors from the country in the core of the network (Tables 9 and 10). Furthermore, three other countries—Belgium, Germany and Spain—with growing rates and a low level of alliances with authors from the US throughout the three stages were also selected (Tables 11 and 12). The statistical significance level was

Table 9 Group of countries with a sustained increase in articles published in the *SMJ* with the cooperation of authors from the country in the core area of the network

Countries	Stage I		Stage II		Stage III	
	Cooperation	Articles	Cooperation	Articles	Cooperation	Articles
Canada	2	36	13	35	21	66
France	9	19	16	43	20	51
United Kingdom	5	47	7	68	10	70

Table 10 Statistical significance of the increase in articles, in relation to the increase in cooperation with authors from the core country

Treatment name	<i>N</i>	Missing	<i>M</i>	<i>SD</i>	SEM
Col 2	3	0	62.333	10.017	5.783
Col 1	3	0	34	14.107	8.145
Difference	3	0	28.333	4.726	2.728

$t = 10.384$ with 2 degrees of freedom ($P = 0.009$); 95 percent confidence interval for difference of means: 16.594–40.073

Table 11 Group of countries with a sustained increase in articles published in the *SMJ* and with a low level of cooperation with authors from the country in the core area of the network

Countries	Stage I		Stage II		Stage III	
	Cooperation	Articles	Cooperation	Articles	Cooperation	Articles
Belgium	0	3	1	5	1	7
Germany	0	1	1	7	2	15
Spain	0	3	1	4	9	34

Table 12 Statistical significance of the increase in articles in relation to the low level of cooperation with authors from the core country

Treatment name	<i>N</i>	Missing	<i>M</i>	<i>SD</i>	SEM
Col 1	3	0	2.333	1.155	0.667
Col 2	3	0	18.667	13.868	8.007
Difference	3	0	-16.33	13.65	7.881

$t = -2.072$ with 2 degrees of freedom ($P = 0.174$). Power of performed test with alpha = 0.050: 0.193; 95 percent confidence interval for difference of means: -50.243 to 17.576

established by the calculation of the paired t -test, using SigmaStat V 3.5 Software for Windows.

The results show that the development of the three countries is owed, mainly, to the sustained increase in cooperation with the country in the core area of the network. This is proved by the value of the t -test, $P = 0.009$. This result tells us that the cooperation of the country placed in the core position of the network's structure greatly influences the development, consolidation and evolution of the countries placed in the semi-periphery and periphery of the network.

The results show that the countries that have low levels of cooperation with the country in the core area of the network developed more slowly than the countries that had more cooperation with this country. This can be seen in the t -test, where $P = 0.174$. The higher the level of cooperation with authors from the country in the core of the network, the higher the number of articles published in the *SMJ*. This result proves the importance of cooperation in relation to the increase in the number of articles published in the *SMJ*.

The countries that maintain and increase their number of articles published in the *SMJ* in co-authorship with authors from the core country experience a sustained growth rate in the structure of the network, which is evidenced by their centrality degree, emission rate, and the strength of their position in the area of the network they place in.

Another fact that supports the importance of cooperation in the strategic management scientific community development around the *SMJ* is the inclusion of new countries in the network's structure. In the first stage, (1980–1989), 33.33% of the members of the network used the links of cooperation with authors from the country in the core area, or with the strong countries in the periphery, as bridges to get into the network.

In the second stage, the percentage of countries included in the network's structure was 83.33%. In all the cases, the articles published were co-authored by authors from institutions of the country in the core area. Also, authors from France and the United Kingdom participated in two articles.

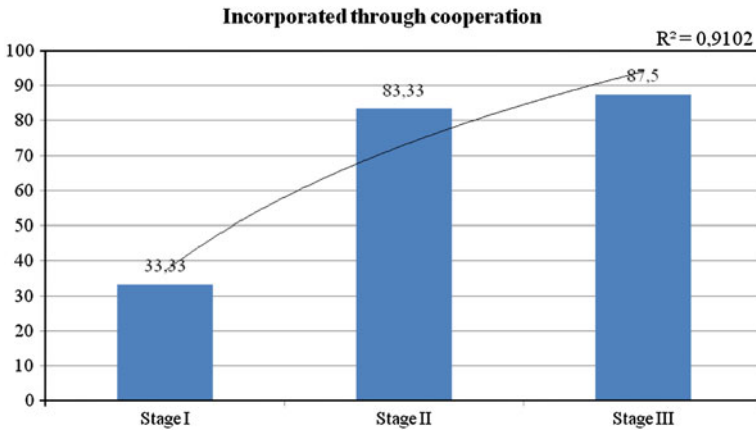


Fig. 7 Percentage of countries incorporated into the network's structure by means of cooperation

In stage III, 87.5% of the countries incorporated became so by means of cooperation. About 42.85% of those countries received cooperation from the country in the core area of the network, 42.85% from countries in the semi-periphery (Canada and UK), and 14.28% from a country in the periphery of the network.

Figure 7 shows the sustained increase in the number of countries in the network's structure through cooperation, mainly with authors from institutions of the country in the core of the network. In the third stage, the percentage of countries incorporated by cooperation received from countries in the semi-periphery area increased, showing the development of this area of the network. This means that countries from the semi-periphery consolidated their position and began to win followers.

Results show that countries with a high number of authors included in the network and that do not display any growth in cooperation rates remained on the periphery of the network. Conversely, they did not evolve from their position or stage. That is, they remained in the formation phase.

Conclusions

The results of our study show that the network structure of the scientific community of the strategic management discipline around the *SMJ* went through three stages: (1) formation/incorporation, (2) consolidation/dissemination, and (3) expansion/transformation.

These stages have been established taking into account a standard of characteristics observed within the network structure in the variables emission index, reception index, density, connectedness, position of vertices within the network structure, relation between vertices in the core of the network and vertices on the semi-periphery or periphery, and relation between vertices in the same position: periphery-periphery or semi-periphery-semi-periphery. This segmentation could be effective in assessing the transition of an academic network in other disciplines or subfields through the strategic management theory. The actors' evolution at each stage will be cyclical. That is, new countries will be added and then go through each evolutionary phase, allowing the inclusion of other countries to the core position of the network. This whole process will repeat consecutively.

The origin of the emission–reception indices makes it possible to estimate a vertex development within the network structure, and to define the process of changing from vertex to node and to hub during the transition through some of the evolutionary stages of an academic network.

Cooperation serves as a bridge for the new countries' inclusion in the network structure, which is evidenced by $r^2 = 0.91$. This pattern indicates that the countries sought cooperation with the country in the core of the network as a means of entry. In the third stage, the network presented three thresholds: core, semi-periphery, and periphery. As the countries consolidate their position in the semi-periphery area, they begin to win followers. This favored their transformation into hubs, and sub-networks emerged, and the process of dissemination flows faster than in previous stages.

Countries whose authors were assisted by authors from the countries in the core and semi-periphery of the network showed higher growth and development levels than those with increasing patterns but no cooperation effects. The results also reveal that as cooperation in the publication of articles in the *SMJ* increases, so does the number of authors from other countries included in the network of the strategic management scientific community. Similarly, the *SMJ*'s influence over the development of the discipline is strengthened. Results from linear regression analysis show that network centralization conditions a 99% increase in countries' emission rates.

All indices used to evaluate the dynamics of the evolution of the strategic management scientific community show a sustained increase through the three stages. This evidences the influence of the *SMJ* in the growth and consolidation of this academic network. Although the results of the present study do not allow confirmation, they point to a progressive increase in the influence of the strategic management field in the general management academic field.

There is a greater cooperative link between authors from the country in the core zone and authors from the countries on the semi-periphery than between authors from the countries on the semi-periphery and authors from the countries on the periphery. Our findings, like those of Wagner and Leydesdorff (2005b) for science overall, suggest that knowledge dissemination about the strategic management discipline is taking on the characteristics of a knowledge system with its own internal dynamics.

Results gathered from this paper could be broadened by other studies related to the structure of inter-university networks for research, which will promote knowledge concerning the diffusion of notions on the strategic management discipline. It would thus be interesting to analyze the role of universities and business schools in the development of the strategic management discipline of the country in the core of the network. It would also be interesting to study more in depth the network structure transformation after some years of the *SMJ*'s publishing endeavor. Finally, similar studies about other journals and a comparison of their results with the ones collected in the present paper could shed light on the evolution of the strategic management scientific community from other important sources of research and not only from the *SMJ*, although the latter publication prevails within the discipline.

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