



Science mapping analysis of change management

Análisis de mapeo de la ciencia sobre gestión del cambio

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ABSTRACT:

The purpose of this paper is to obtain a knowledge's science mapping of the different approaches of Change Management; trying to help practitioners to reduce failure cases identified in previous investigations detected. It has been identified and understood the literature evolution, productivity, trends and classification of the different most highlighted research topics.

Keywords: Change-Management, Bibliometric-Analysis, Technology, Innovation

RESUMEN:

El objetivo de este trabajo es presentar un análisis bibliométrico de los diferentes enfoques que existen sobre la Gestión del Cambio, intentando ayudar a los gestores a reducir los fallos identificados en anteriores investigaciones. Para ello, se ha identificado y analizado la evolución de la literatura, la productividad, las tendencias y la clasificación de los temas de investigación más destacados.

Palabras clave: Gestión-del-Cambio, Análisis-Bibliométrico, Tecnología, Innovación

1. Introduction

One of the most analysed topics from the point of view of organizations is Change Management (CM). Good CM leads to competitive advantages. Today is one of the most strategic aspects to achieve organisational success within the challenging and complex changing environment in which organisations find themselves (Al-Haddad and Kotnour, 2015; By, 2005). However, currently there is no research that explains all change approaches in a unified way (Nyström et al., 2013). Even though there are studies about CM carried out by specific sectors, countries or stakeholders, for example Pirela, (2005) or Lopez et al., (2018). Also, there is currently no framework that scientifically unifies knowledge and its influence on organizations' preparation strategies for a success change. This has resulted in failure rates of 70 percent, as indicated by investigations of failed cases (Burnes and Jackson, 2011; Rafferty et al., 2013; By, 2005; Al-Haddad and Kotnour, 2015). It is necessary to undertake scientific mapping and share knowledge and lessons learned so that practitioners can obtain more information and try to reduce this failure rate.

Cleland (1967), was the first author to introduce the concept of CM in the academic literature who analyzes the new figure of the project manager that was appearing in the organizations of the time. Although the pioneer and inspirers in the field of CM is Kurt Lewin (1890-1947), a German Jewish psychologist based in the United States, whose work has made numerous contributions to modern Psychology and also in Organizational Psychology as highlighted Schein (1996).

Considered the creator of the Three Step Change Model, which, along with its other three main elements: Field Theory, Group Dynamics and Research for Action, provides a planned approach to change (Burnes, 2004); also Lewin's approach and his contribution are considered as a reference and a critical element in academic research, in-use nowadays (Rosenbaum et al., 2018). According to Burnes and Jackson (2011), recently it has been recognized that one or two methods of change are not enough to cover the different situations in organizations. Besides, the organizational context the way of managing the change are factors that influence on the level of resistance towards it (Michel et al., 2013); as well as not to consider the people and their feelings (Nyström et al., 2013).

In 1995, was presented the first interdisciplinary literature review of CM including a framework of the four basic theories that explain the processes of change in organizations. Stating that from the interaction of the specific theories of organizational change and development processes, from one or more of these four theories, it can be constructed other theories more complex (Van de Ven and Poole, 1995). A different literature review identifies eleven systematic change methods under three main theories and specifically six different CM methods (Al-Haddad and Kotnour, 2015).

In literature review studies, the subjective views of the authors might influence on the conclusions (Ramos-Rodríguez and Ruíz-Navarro, 2004). An increasingly used way of undertaking a line of research is the development of a bibliometric analysis that allows a systematic and orderly review of existing literature on the selected topic. Following Zupic and Cater (2015), bibliometric methods introduces quantitative rigor into the subjective evaluation of literature. Two methods of reviewing past literature have traditionally been used: the qualitative approach of a structured bibliographic review and the quantitative meta-analysis approach (Schmidt, 2008). According to Medina and Leeuwen (2012), the structuring of science tries to identify fields, sub-fields and research topics and relate them to each other. It is necessary because the traditional system of classification of science is imperfect, especially for highly multidisciplinary environments and because it helps to evaluate performance within an appropriate context. In this sense, bibliometric mapping is one of the most useful functions within the field of bibliometrics (Morris and Van der Veer Martens, 2008). Ramos-Rodríguez and Ruíz-Navarro (2004) emphasize this utility because it is an analysis that works with mathematical tools and statistics on the registration of citations and co-citations, thus obtaining a map of what was studied on the chosen topic.

The use of bibliometric methods offers a different perspective on the field of knowledge, since it can analyze any type of study in which there are connections between the studies and in the corpus of the studies analyzed. If compared to the structured review of the literature, the mapping of science from a macro approach finds patterns. Thus, a wide range of studies can be handled and a graphic description of a selected field of research can be provided (Zupic and Cater, 2015).

In recent years, bibliometric studies have been conducted in multiple disciplines within companies, but in the specific case of CM as a field of study, there is only one bibliometric analysis, conducted by Giraud and Autissier (2013). The Journal Organizational Change Management (JOCM) is analyzed, due to its regularly publishes articles on the subject, although it should be acknowledged the articles tend to only focus on organisational change management. Thus, the authors conduct a study of articles that address this issue, making an analysis of citations and co-citations. As a result, 40 influential papers are identified in the journal during the period 1995-2011, and conclude that the main topic addressed was the process of change in organizations.

Given the limitation of Giraud and Austissier study (2013) and the absence of other subsequent research with this method, the purpose of this paper is to offer a broader, structured and updated view of the literature on CM and reflect the main themes that compose the field of study. To do this, a method of mapping science, has been used, based on the quantitative approach of bibliometric research methods for its usefulness, as indicated above. Through this method, it has been possible to create a visual representation of the structure of the research area where elements such as documents, authors, journals and/or words are divided into different groups (Zupic and Cater, 2015).

After this introduction, the second section explains the methodology, the third section describes the results and the analysis obtained and, in the fourth section the conclusions and limitations identified by this study are presented.

2. Data source and methodology

The data source for this study comprised articles published during 1967-2017, across a wide sample of indexed scientific journals, taking into consideration those related to business and management themes. The main idea is to represent this discipline as a whole (Ramos-Rodríguez

and Ruíz-Navarro, 2004; Calabretta et al., 2011) and specifically in relation to bibliometric techniques. Even though the proportion of books in documents cited is higher than articles, in this study it has been decided to include just articles because recently the influence of journal articles into the CM field has increased (Giraud and Autissier, 2013), and also because they are a "certificated knowledge" which has been reviewed by fellow researchers (Ramos-Rodríguez and Ruíz-Navarro, 2004).

The data used to perform this bibliometric analysis were extracted from WOS, platform of Thomson Reuters. WOS was selected against other platforms because it is the reference database that provides the most completed current and retrospective coverage of the Sciences, Social Sciences, Arts and Humanities, dating back to 1900 (Martínez et al., 2015). In addition, WOS develops the famous impact factor of a journal indexed in the JCR, considered a key indicator to evaluate the quality of a researcher's scientific activity (Bordons and Zulueta, 1999).

The greatest difficulty of this study was the selection of the search term to group the bibliography referring to CM. Focusing on the discipline of Social Sciences, the main collection of WOS was selected, performing the search by topics because this selection included articles that contain those concepts in their title, summary and keywords. The query was conducted in English and in a strict manner, adhering to the key concept: "Change Management". Therefore, the final query was made with the following terms: TS = ("chang* manage*"). Those belonging solely to the Social Science Citation Index (SSCI) database were selected. Likewise, articles selected were in all languages and publication date limited up to 31 December 2017. Thus, the sample obtained was a total of 1,659 articles published. From which we refined the search to include only those of "Management" and "Business" categories included in WOS, obtaining a final result of 797 documents.

To avoid data smoothness, the best option would be to choose periods spanning only one year. However, it was found that not enough data were generated in the span of a single year to obtain a good performance from science mapping analysis (Martínez et al., 2015). The entire time period (1967–2017) was subdivided in two consecutive periods 1967–2007 and 2008–2017, to show the conceptual evolution of the CM. The reason for this consecutive time periods separation has been to analyze the literature existing before 2007. From 2008 the growth in number of published articles increased due to the economic situation experienced by the crisis; many organizations were questioning how successfully manage of organizational change within business transformation during economic crises (Ashurst and Hodges, 2010). Additionally, although it is common to use periods covering the same time span, the decision was taken to have the first period span forty years because of the low numbers of researchers and publications in the early years.

The bibliometric analysis tool used for this article is the SciMAT software. According to Cobo et al., (2011), SciMAT allows the analyst to perform a mapping analysis of science in a longitudinal framework in order to analyze and track the conceptual, intellectual or social evolution of a field of research over consecutive periods of time.

Regarding the methodology used in this study, two types of bibliometric methods have been used: In the first phase, a co-occurrence analysis of keywords is accomplished establishing a simultaneous co-occurrence relationship between two units of analysis (documents, authors, most cited articles, etc.). This relationship occurs when two keywords appear together in a document. This analysis allows to identify the basic topics of a scientific field showing conceptual and cognitive aspects of it (Cobo, et al., 2011) . This bibliometric technique uses part of the information contained in the documents collected from the bibliographic databases. In this phase, the productivity and performance of CM is analyzed through the units of analysis; trying to frame the most outstanding topics, as well as measure their impact in the scientific area. Impact indicators provide information on the influences of research documents, while link indicators identify relationships between researchers and research fields (McCain, 1990).

In the second phase, a clustering or grouping algorithm is applied to the network, ensuring the different topics that make up the research field are obtained, as well as the keywords that internally configure the different clusters. Likewise, the subnetworks, or sets of nodes that are linked to each other strongly, but poorly with the rest of the network, are extracted. Subsequently, the "strategic diagrams" where the centrality and density of each topic are analyzed, as well as the number of documents, h-index, and number of citations.

The data manipulation into themes was undertaken through a co-occurrence analysis of keywords. It is recommended to establish 2 words as a minimum frequency threshold to begin with because it is the lower level of demanding coincidence. The data were filtered in this case using 2 for

Period 1, due to the low volume of articles per year, and 3 for Period 2, considering only the units of analysis with a frequency higher than or equal to the selected frequency threshold (Martínez et al., 2015).

The positioning in the Strategic Diagram established by Callon et al., (1991) of each topic, within the study area is shown by some areas with labels representing the most central keyword (node) of the thematic network. Its positioning is determined by the centrality that measures the strength of the external links on the subject with other subjects and by the density that measures the strength of internal links between all the keywords that describe the research topic. According to Cobo et al., (2011), depending on these two variables we can classify the different subjects into four categories within the Strategic Diagram: motor themes (upper-right quadrant), highly developed and isolated themes (upper-left quadrant); emerging or disappearing themes (lower-left quadrant) and basic or transversal themes (lower-right quadrant).

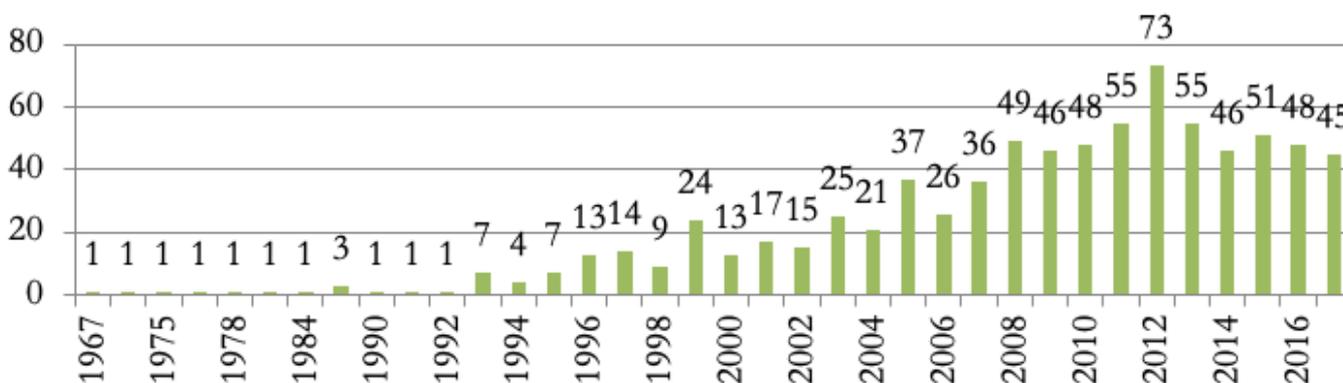
3. Results and analysis

The results obtained from the analysis are presented in the following three sections.

3.1. Evaluation and analysis of scientific output and production

Firstly, the findings of a descriptive character starting with the volume of documents. The evolution of the publications is shown year after year (Figure 1). It has been observed how the field of study has had a particularly marked growth since 2007, as mentioned before. From this date, an increased trend in the number of publications is appreciated, with fluctuations ranging from between 46 and 55 publications per annum. The average number of records per annum prior to 2007 is 20.8, whereas from 2008 it is 51.6. Specifically, during Period 2, 516 articles were published, 64.74% of the total. The highest number of academic articles on the field of study was during 2012, with 73 articles published.

Figure 1
Number of articles on CM



From analysing the authors who have published CM studies, Rober Levasseur, from Walden, University of Florida (United States), had the highest number of registered publications (see Table 1). However, the analysis identifies that authors with more documents does not coincide with the most cited authors. Pierre Collettere from the University of Hull (Canada) has the highest number of citations (1020) within two publications, and Paul Legris from the University of Quebec and John Ingham of the Sherbrooke University (Canada) each having 1015 citations.

Table 1
Production and performance of the authors in the field of study.

Authors with more documents			Authors with more references	
Authors	Number of Doc.	Number of citations	Authors	Number of citations
Levasseur, Robert E.	10	49	Collettere, P	1020
Cao, GM	4	42	Legris, P	1015

van der Voet, Joris	4	36	Ingham, J	1015
Adams, Susan M.	3	10	Orlikowski, WJ	666
Alas, Ruth	3	19	Caldwell, SD	301
Becker, BE	3	31	Herold, DM	298

The analysis of the production by country was undertaken by counting the number of documents that were published according to the affiliation of their authors. The authors are located in 62 different countries. Globally, USA and England are the countries with more documents published.

Table 2
Most productive countries

Country	Number of Doc.
United States	194
England	159
Australia	80
Netherlands	53
Canada	41

The most cited articles within the field of study are summarised in Table 3, including the authors and the journals published. The maximum number of citations obtained is 1015 in the article by Legris, Ingham and Colletette, (2003).

Table 3
Most cited articles in the field of study

Title	Authors	Journal	Year	Citations
Why do people use information technology? A critical review of the technology acceptance model	Legris, Ingham and Colletette	Information & Management	2003	1015
Case tools as organizational-change-investigating incremental and radical changes in systems-development	Orlikowski	MIS Quarterly	1993	479
A taxonomy of players and activities across the ERP project life cycle	Somers, and Nelson	Information & Management	2004	225
The future of leadership: Combining vertical and shared leadership to transform knowledge work	Pearce	Academy of Management Executive	2004	188
An improvisational model for change management: The case of groupware technologies	Orlikowski and Hoffman	Sloan Management Review	1997	187

The authors study the implementation of information systems within companies, through the application of a Technology Acceptance Model (TAM) originally proposed by Fred Davis 1985, to empirical studies to help understand the associated behavior use.

It has been identified 151 journals that published articles related to Change Management, Table 4, summarises them. JOCM is the one with the highest number of publications.

Table 4
Scientific journals addressing CM

Journals	Quartil 2017 JCR	Number of Doc.	%
Journal of Organizational Change Management	Q3	181	22.7
Total Quality Management & Business Excellence	Q3	24	3.0
International Journal of Operation & Production Management	Q2	22	2.8
Management Decision	Q3	22	2.8
International Journal of Project Management	Q1	19	2.4
Personnel Review	Q3	17	2.1
Journal of Applied Behavioural Science	Q3	16	2.0

3.2. Creation and analysis of scientific maps

This section evaluates and analyzes the performance and productivity of CM as a whole, the individual subject areas within, and the keywords that make up each topic. The research conducted in the periods pivot on 9 representative clusters of the main thematic areas in Period 1 and 22 in Period 2.

To obtain a visualization of the topic CM and analyse the most highlighted themes for each sub-period, strategic diagrams were constructed (see Figure 2 and Figure 3). In the diagram (a) the volume of the sphere is proportional to the number of published documents associated with the keyword and in the diagram (b) to the number of citations received. This helps to position the theme in the corresponding place in the graph, according to their centrality or importance in the development of the theme.

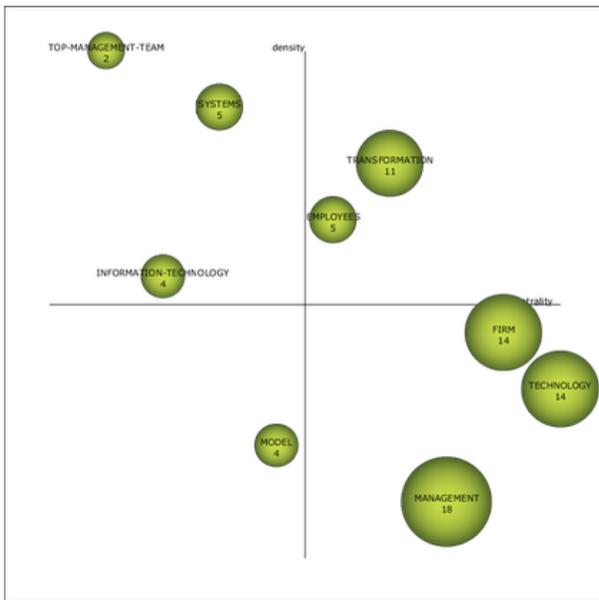
The performance measures of each period are given in Table 5 (a) and (b): the number of documents, h-index of the documents (h-index: the articles of the total number of articles on the subject that have at least h citations) and citations of those documents.

In the first period (1967-2007), analysing the performance measures of the strategic diagram, Figure 2 with Table 5 (a), CM pivots in 9 themes. There are two motor themes: Transformation, and Employees. The first one is the third most important theme, it has a medium citations rate. It is mainly focused on performance, transformation, strategic and managing change. Employees even being a motor theme, gets a low impact and citation rates. It is related to Attitudes, Behavior and Strategy.

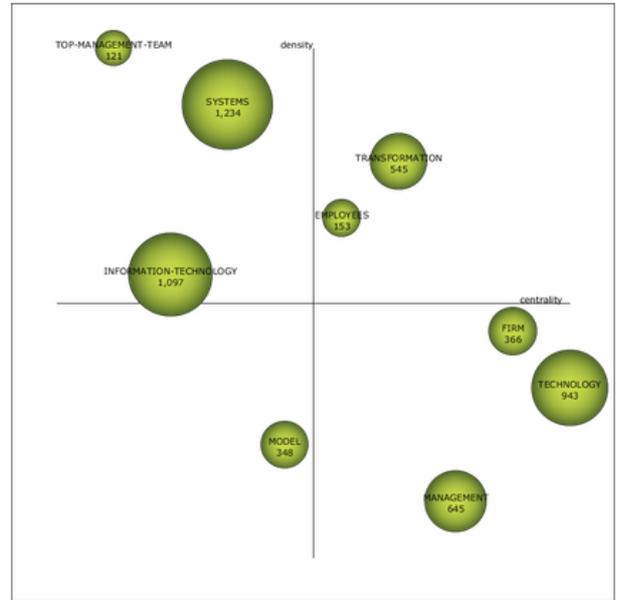
There are three basic and transversal themes: Management could be considered the most important research theme in this period. It obtained the best h-index rates in the largest set of documents and a high citation count. It is related with different managerial aspects such as Decision-Making, Quality, Management, Corporate-Culture, Social-Economics, applied in different sectors like Industry or Public-Sector. Also the theme is related to Psychology, Uncertainty, Choice, Metaphor.

Firm as the second most important theme, also presenting high scores in performance measures. It is related to different management areas such as Human-Resource-Management, Competitive-Advantage, Strategic-Choice and with some other technical or functional areas such as Frameworks, Competences, Determinants, Environment, TQM.

Figure 2
Strategic diagrams: Period 1



(a) Based on the number of published documents



(b) Based on the citation

Finally, Technology obtains a high impact index and a high number of citation rates. It is related to general topics of Technology, Implementation, Systems Implementation, Information-Systems, Innovation, Computers, as well as concepts such as Failure, Comunicación, Perspective, Capabilities or Organizations.

Systems as highly developed themes, obtains the highest number of citations. Moreover, two themes could be considered highly cited: Information-Technology and Technology. The only emerging theme is Model, it receives a low number of citations, and impact index rate. It is related to Knowledge and Planning.

Table 5 (a)
Performance Measures for the Themes (Period 1)

Themes	Documents	h-index	Citations
TRANSFORMATION	11	10	545
TECHNOLOGY	14	10	943
FIRM	14	11	366
MANAGEMENT	18	13	645
EMPLOYEES	5	5	153
SYSTEMS	5	5	1,234
TOP-MANAGEMENT-TEAM	2	2	121
INFORMATION-TECHNOLOGY	4	4	1,097
MODEL	4	4	348

Also, Systems, Information-Technology and Top-Management-Team are isolated or highly developed topics. Systems gets the highest citation count and a medium h-index impact. It is related with topics such as Systems, Field, JIT, Punctuated-Equilibrium and Complexity-Theory. Information-Technology presents the second most citation rates. This theme is related with Business-Process-Reengineering and Technology-Acceptance-Model. Finally, Top-Management-Team stood out among the peripheral themes because of its number of citations and h-index. This theme essentially focused on the sphere of politics and resistance-to-change.

In the second period (2008-2017), analysing the strategic diagram, Figure 3 and the performance measures of themes (Table 5 (b)), it shows a higher number of themes which CM pivots compared to the first period. It has 22 themes and many more keywords since 2007. This is a consequence of the increased number of publications as a result of the publishing cycle conversion through the Internet (Thelwall, 2008) and due to the maturation of the theme (Giraud and Autissier, 2013).

Table 5 (b)
Performance Measures for the Themes (Period 2)

Themes	Documents	h-index	Citations
Sensemaking	16	4	117
Stress	16	5	166
Innovation	53	16	907
Critical-success-factors	19	5	181
Resistance	24	7	165
Metaanalysis	22	9	456
Impact	18	6	278
Leadership	20	7	153
Organizations	42	10	374
Model	33	11	515
Commitment	14	7	156
Competitive-advantage	15	6	240
Technology	11	6	133
Human-resource-management	12	7	105
Success	9	3	77
Manufacturing-strategy	3	3	60
Consumer	3	2	71
Organizational-development	6	3	32
Organizational-culture	6	2	27
Narratives	7	5	70
Self	3	2	26
Decision-making	4	2	15

There are twelve major themes (motor themes plus basic themes): Innovation, Metaanalysis, Commitment, Critical-Success-Factors, Competitive-Advantage, Sensemaking, Stress, Impact, Organization, Resistance, Technology and Model. According to the performance measures, it could be highlighted 4 themes: Innovation, Model, Organizations and Metaanalysis. These themes get important impact rates, achieving more than three hundred and fifty citations, and get the highest h-index rates.

Innovation consolidates as motor theme, with the largest number of document, h-index rates and number of citations. It is related to different aspects of performance, capabilities, creativity, exploration, routines, diffusion, knowledge-management, firm.

Technology consolidates its position as basic theme, it is related to varied topics such as transformation, attitudes, organizations, knowledge, user-acceptance, technology, etc. The evolution makes changes in organizations based on technology or technological models being considered as strategic, taking into account the relevance of macro-context analyses to understand the complexity of organizational change, Bayerl et al., (2013).

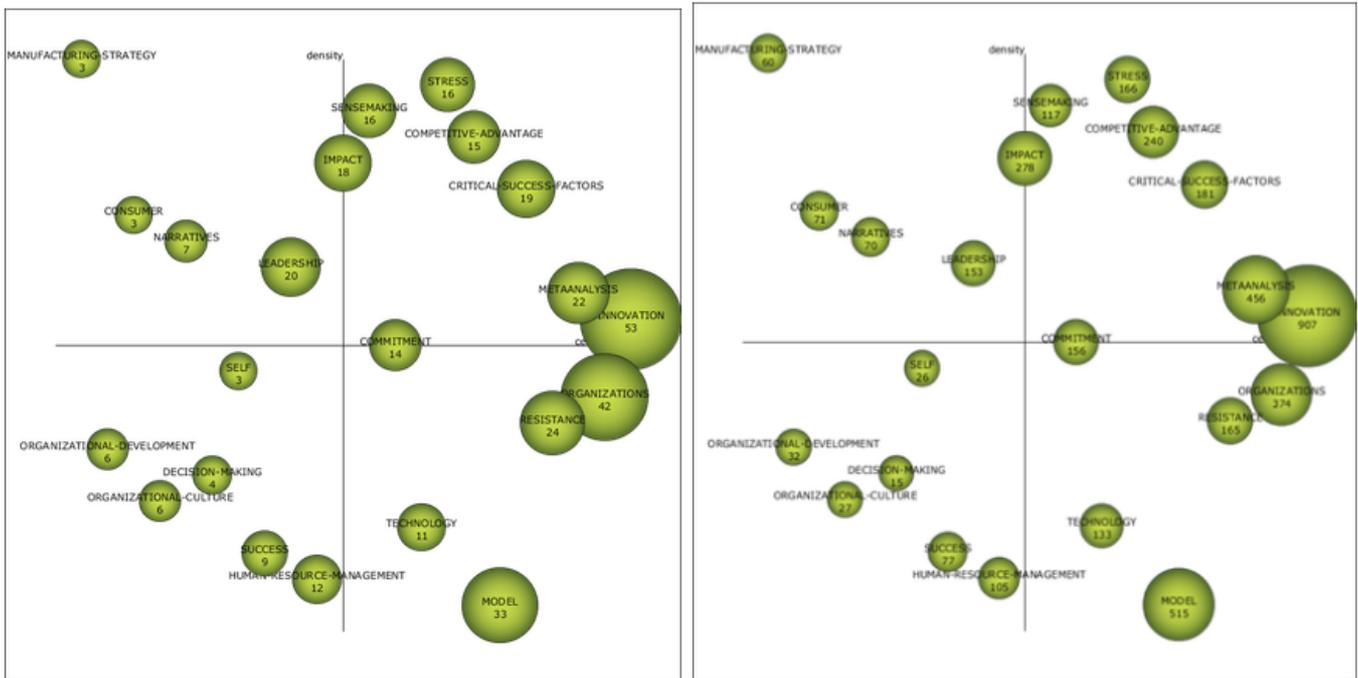
Model as basic theme reaches the second most important impact rate and receives a great number of citations. It is related to general topics such as appraisal, corporate-social-responsibility, quality, Grounded-Theory, self-efficacy, and strategy.

Organizations became a basic theme, with the third highest h-index rate in the second largest number of documents. This theme is related to Management, Software and Systems. The theme Metaanalysis gets high rates in all performance measures rates, and it is related to Behavior, Satisfaction, Outcomes and Job-Performance within others.

In the emerging quadrant there are six themes of this period: Human-Resource-Management, Success, Organizational Development, Organizational-Culture, Self and Decision-Making. All of them obtain a low impact and low citation rates. Finally, it is also noted that the themes:

Manufacturing-Strategy, Consumer, Narratives, and Leadership appear in the highly developed and isolated upper-left quadrant, arise within this period.

Figure 3
Strategic diagrams: Period 2

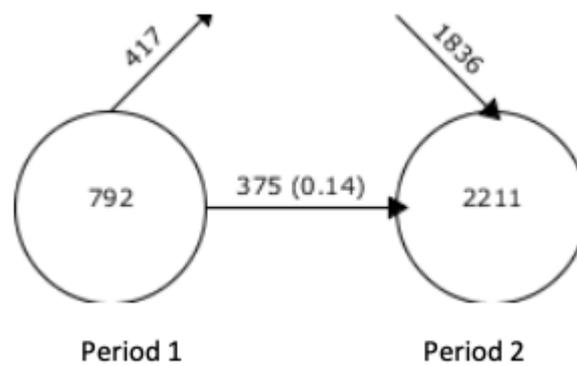


(a) Based on the number of published documents

(b) Based on the citation

The progress of the stability measures across the two consecutive periods is shown in Figure 4. The circles represent the periods and the number of associated keywords, 792 in Period 1 and 2,211 in Period 2. The keywords evolution indicates the degree of overlap or overlapping elements between the periods.

Figure 4
Longitudinal Results
Overlapping Map



The horizontal arrow represents the number of keywords shared by both periods (375) and the Similarity Index between them is shown in parentheses (0.14). The upper input arrow represents the new elements found in Period 2, 1836 and the upper output arrow represents the keywords that are present in Period 1 but not in Period 2, 417.

3.3. Conceptual evolution

Figure 5 shows the thematic evolution of CM through the periods. The elements shown to the left correspond to Period 1 and those to the right correspond to Period 2. The continuous lines mean that the linked themes share the name, either because both have the same name or because the name of one of the themes is part of the other topic. Conversely, a dotted line means that the themes share elements that are not the name of the theme. The thickness of the line is proportional to the inclusion index and the size of the sphere is proportional to the number of published documents. The different colour shadings group together the themes which belong to the same thematic area.

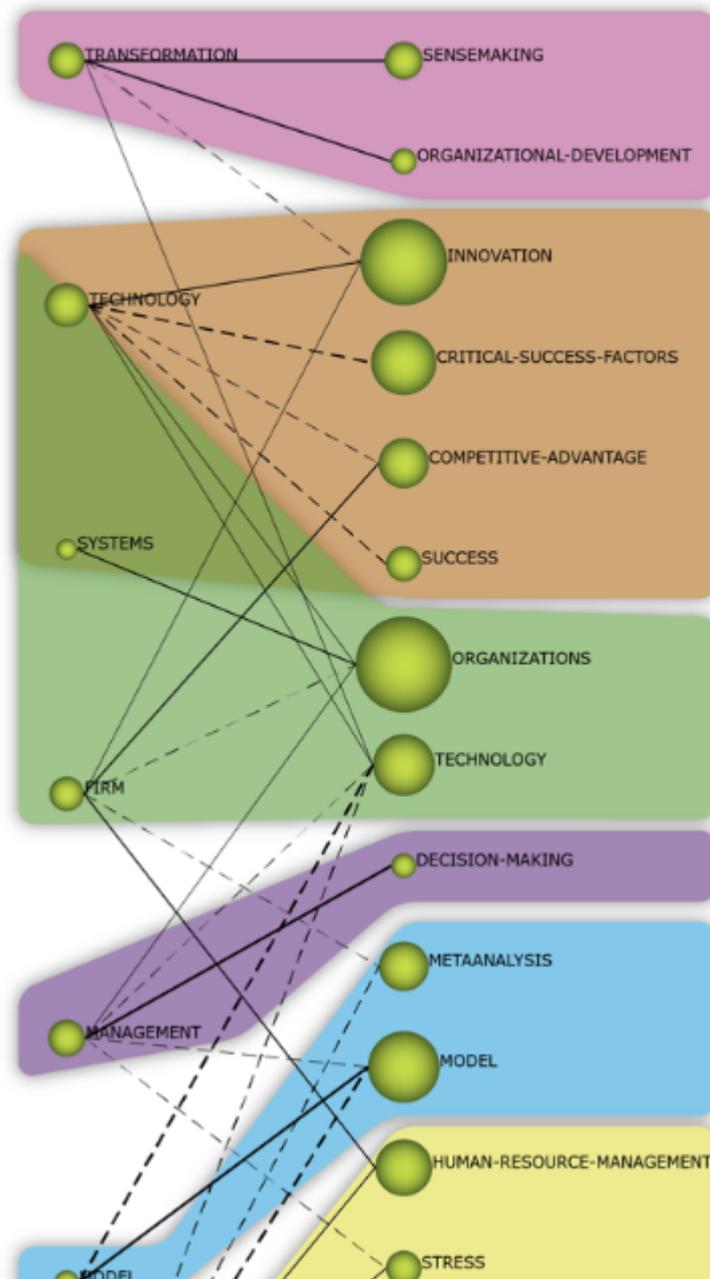
Combining the science maps (strategic diagrams and evolution maps) with the performance indicators (citations and h-index) were detected seven thematic areas: Transformation, Innovation, Organization, Technology, Decision-Making, Model and Human-Resources-Management.

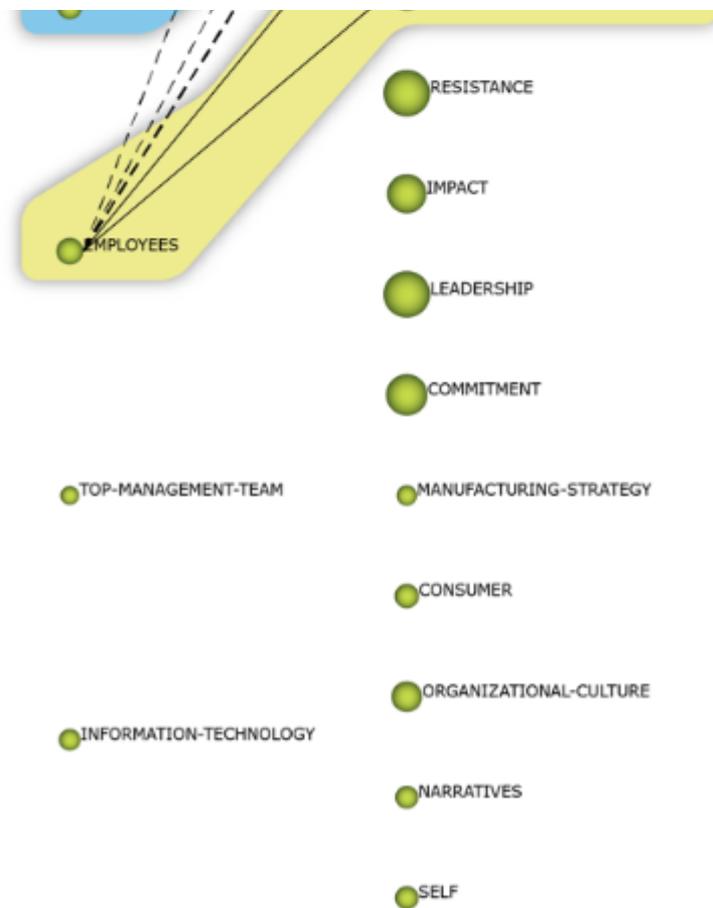
Four of these themes vertebrate the research on CM scientific discipline in the last years: Model, Technology, Innovation and Organization. The first two are included in both periods, confirming its importance. Model goes from the emerging to the basic quadrant, in fact, it could be considered as one of the most important topics in the last years due to its impact rates within a moderate number of documents. It was related to general concepts as Knowledge or Model to create connections with Quality, Strategy, Self-Efficacy within others. The connections show that it evolves from Model, Employees and Management.

Innovation gets the best performance indicators being a motor theme. It evolves from Technology, Transformation and Firm and it is related to words such as Creativity, Performance, Capabilities. Finally, Organizations evolves from Systems, Technology, Firm and Management as a basic theme. It is related to themes such as Identification, Management, Software and Systems, within others concepts.

Decision-Making evolves from Management, Transformation that evolves into Technology, Sensemaking and Organizational-Development. At the same time, Employees evolves into Stress and Human-Resources-Management within others.

Figure 5
Thematic evolution of the CM research field
(1967-2017)





4. Conclusions

This paper corroborates that CM has gained prominence throughout the years, in the great growth of articles, publications and citations. The United States and England are undoubtedly the most productive countries, doubling the publications of the third one. CM field presents good cohesion because the majority of the themes detected is grouped under a thematic area and some come from a theme that had appeared in the previous period.

During last years, there is a significant increase of new keywords that compose the field of study of CM. From the seven lines of work that have been defined are focused, there are four great thematic areas. Model, due to its high impact rates and number of documents reaffirms as a line of continuous future research. The evolution of the theme shows that the knowledge of the model and a planning evolves into the implementation of the strategy. On the other hand, Technology, is a key element to obtain transformation in organizations. Also the researches are growing on Innovation, being this one a reason for organizations of getting a successful competitive-advantage. Finally, Organizations is a basic thematic area formed by the management and the application of Systems and Technology.

Following the evolution of the topics analyzed over time, and through the keywords that compose them, it seems that the most important aspects of CM in the first period are focused on the management and on the implementation of technology. While in the second period, there is a growing interest to study the models of CM. Understanding and implementing the best strategy, will transform and evolve towards a competitive advantages with a broader and a transversal perspective of CM. The challenge lies in the management of the resolution of the current complex situations that organizations face, where it is necessary that all areas of the organization will interact.

Also, it has been identified several emergent themes that could be future research lines for the scientific community as: Organizational Development, Decision Making, Self, Success, and Human Resources Management. Specially the last one, due to the number of documents and impact rates obtained. Even though there is no essential advance in the models of CM nowadays there is interest on researching new thematic areas related to CM.

A number of limitations were identified during the study. Some of them are according to the steps taken in the SciMAT program, as well as the establishment of the search in the database being recognised that other terms could have been included. It should also be acknowledged that whilst,

the search was undertaken in WOS, there are other databases that could be taken into account for future research. Also, it is important to mention that has not been included books publications. A future research would be to overcome the highlighted limitations and make different approaches to CM. Detect and development of models that encompass and facilitate the understanding of the interrelation of the problems that configure the complexity that organizations face nowadays. Trying to understand those relationships through models that allow practitioners to better address the changes within the company.

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