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Entrepreneurial leadership factors: a bibliometric analysis for the 2000-2020 period

Factores en el liderazgo emprendedor: un análisis bibliométrico durante el periodo 2000-2020

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ABSTRACT

This work aims to present an overview of the factors, attributes or behaviour of entrepreneurial leadership research with a comprehensive bibliometric analysis. 1,594 articles, dated from 2000 to December 2020, were taken from the main Web of Science database collection and analysed with a bibliometric study using performance analysis and scientific mapping methods. To evaluate the importance, quality and impact of publications, indicators like productivity, citations or h-index were used to obtain an analysis of trends and advances on the most relevant publications, authors, journals and countries. Research was complemented by scientific mapping obtained through co-citations, bibliographic couplings, co-occurrences and co-authorships. The results show that the trend of publications has considerably increased since 2015, and the highest productivity was recorded in 2020. The USA and England are two of the most influential publishing countries, although the network analysis reveals cooperation with different countries. The most productive journal is Sustainability and the most influential is the Journal of Business Venturing. This systematic mapping of the field helps to illustrate the research evolution over time, identifies areas of current interest for use in theoretical and empirical frameworks, and provides a solid roadmap for future research. The keyword analysis reveals that the term "entrepreneurial leadership" started to be used in its own right from around 2018 on average.

Keywords: Bibliometric Analysis, Entrepreneurial Leadership, Leadership Factors, Entrepreneurship, Co-citation.

RESUMEN

Este estudio presenta una visión general de la investigación sobre los factores, atributos o comportamientos de liderazgo en el emprendimiento a través de un exhaustivo análisis bibliométrico. Se extrajeron del año 2000 a diciembre de 2020, 1594 documentos de la colección principal de la base de datos Web of Science, y se analizaron a través de un estudio bibliométrico utilizando los métodos del análisis de rendimiento y el mapeo científico. Para evaluar la importancia, el impacto y la calidad de las publicaciones se usaron indicadores como la productividad, el número de citas o el índice-h, entre otros, obteniendo un análisis de tendencias y avances sobre las publicaciones, autores, revistas y países más relevantes. Además, se complementó el análisis gracias a una cartografía científica obtenida mediante técnicas de co-citaciones, acoplamientos bibliográficos, co-ocurrencias y co-autorías. Los resultados muestran que la tendencia de publicación aumenta significativamente a partir de 2015 y es en 2020, cuando se registra la mayor productividad. Estados Unidos e Inglaterra figuran entre los más países más publicadores e influyentes, aunque un análisis de la red revela cooperaciones entre diferentes países. Aunque la revista más productiva es Sustainability, la más influyente es Journal of Business Venturing. Además, el análisis de palabras clave revela que el término "liderazgo emprendedor" se comienza a utilizar por derecho propio entorno al 2018 como media. Este mapeo sistemático ayuda a ilustrar la evolución temporal de la investigación, identificar las áreas de interés actual para usarla en marcos teóricos y empíricos, y proporcionar una sólida hoja de ruta para la investigación futura.

Palabras clave: Análisis bibliométrico, Liderazgo Emprendedor Entrepreneurial, Factores de liderazgo, Emprendimiento, Co-citación.

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1. INTRODUCTION

Research into entrepreneurship and leadership acknowledges the contribution of both fields as crucial factors in the success or failure of small- and medium-sized enterprises (Leitch *et al.* 2013; Renko *et al.* 2015; Ng *et al.* 2016; Leitch and Harrison 2018; Simba and Thai 2019), and large corporations (Kuratko 2007). Hence the growing interest in the "new paradigm" of entrepreneurial leadership (EL) (Fernald *et al.* 2005).

EL is defined as "leadership that creates visionary scenarios that are used to assemble and mobilise a "supporting cast" of participants who become committed by the vision to the discovery and exploitation of strategic value creation" (Gupta *et al.* 2004, p. 247) and as "making efficient use of available resources, along with discovering and utilizing new resources with respect to the leadership vision" (Hejazi *et al.* 1993, p. 71). Renko *et al.* (2015) later defined the concept as the process of "influencing and directing the performance of group members toward the achievement of organizational goals that involve recognizing and exploiting entrepreneurial opportunities". For others, EL is defined as a partnership of entrepreneurship and leadership functions that produces a new product, service, or the overall development of the organisation (Kapil and Salgotra 2018).

The success of entrepreneurial activities requires the leader having certain competencies, attributes, skills or factors, defined as specific leadership capabilities (Cogliser and Brigham 2004; Gupta *et al.* 2004; Fernald *et al.* 2005). It is vital to identify and better understand which EL factors are considered the most valuable to overcome the challenges of managing an organisation, a project or a product, which will influence the venture's success and growth. To date, however, information about the knowledge, understanding and identification of these EL attributes, how they have been able to help entrepreneurs to overcome challenges, and whether these attributes can be learned or exercised, is insufficient (Kempster and Cope 2010; Harrison *et al.* 2016; Harrison *et al.* 2018).

For this reason, the research work aims to conduct and present a bibliometric analysis of the literature on EL factors to provide updated knowledge of this field by identifying variables like the publications, authors, countries and sources that investigate it. By presenting certain indicators, such as citation structure, productivity, h-index, among others, it allows us to understand the evolution and trends in the field of these variables. By means of graphic maps of the bibliometric networks of these items, we seek to visualise their links with techniques, such as co-citation, bibliographic coupling, co-authorship and co-occurrences of keywords.

This study is organised as follows. The first part examines the employed bibliometric methods and software, along with their purpose, to explain the search methodology followed to obtain the studied database. Section two presents the results with a study of publications, authors, countries, journals and research areas, which are structured according to number of items, and to their citation structure and evolution over time. A detailed graphical network analysis of the bibliographic data using the VOSviewer software is also included. Finally, the main research debates, conclusions and limitations are addressed after identifying possible future research lines.

2. BIBLIOMETRIC METHOD

The methodology employed in this research is the bibliometric analysis, which is a recognised scientific speciality. Bibliometric studies form an integral part of the methodology for evaluating and quantifying research (Ellegaard and Wallin 2015). The bibliometric technique provides a representative overview of the state of research in various scientific disciplines. It usually applies different procedures, such as the scientific performance analysis or graphical mapping of the field (Gaviria-Marín 2021). In recent years however, it has been extremely productive in the business and management field (Gaviria-Marín 2021).

By means of quantitative statistical techniques, the first approach aims to analyse (Pritchard 1969; Broadus 1987; Cancino *et al.* 2017; Merigó and Yang 2017), the scientific performance of a set of bibliographic documents, their authors, their country of origin (Bonilla *et al.* 2015), the most representative institutions or journals (Thongpapanl 2012), among others, and their evolution over time. This is done by data collection and management, based on the analysis of indicators like productivity and citations (Wallin 2005; Martínez *et al.* 2014), the h-index (Hirsch 2005; Alonso *et al.* 2009) or the impact factor (IF) of publishing journals (Garfield 1972), which provide an insight into a particular research field (Merigó *et al.* 2015). The h-index was introduced by Hirsch (Hirsch 2005) It has become one of the main bibliometric indices to assess a researcher's scientific performance (Alonso *et al.* 2009) by taking into account the number and impact of his/her publications. For its creator, "a scientist has an h-index if the h of his/her Np papers have at least h citations each and the other (Np-h) papers have ≤h citations each" (Hirsch, 2005). This index is also used to measure the scientific performance of different actors (Alonso *et al.* 2009) such as journals (Braun *et al.* 2006), countries (Guan and Gao 2008), institutes or universities (Schubert 2007).

The second approach provides a mapping of the science being investigated by representing the connections or structure of the network in a specific scientific field (Gaviria-Marín 2021).

Given their complementarity, scholars of bibliometric techniques recommend jointly using these procedures (Cobo *et al.* 2011), and is applied by some authors in their research into entrepreneurship or innovation (Vallaster *et al.* 2019; Zaragoza-Ibarra *et al.* 2021).

Following these recommendations, the present study uses bibliometric performance indicators to measure academic output, such as the total number of papers published during a given period of time and their citation structure, the average number of citations per article, the most cited authors, the author's h-index, the IF of journals and data on the geographical distribution of publications and journals, using BibExcel and Excel. Thanks to the free software VOSviewer (version 1.6.15 (0)) (Van Eck and Waltman 2010), analyses are performed using four similarity approaches, namely co-citation, bibliographic coupling, co-authorship and keyword co-occurrence (Boyack and Klavans 2010; Zupic and Čater 2015; Merigó *et al.* 2018), with units of analysis, such as documents, journals, authors, keywords, among others, to observe their connections.

2.1. Search description

Firstly, to perform the bibliometric analysis, the first step was to obtain relevant studies by consulting the Web of Science (WoS) main database collection. WoS is a digital bibliographic platform that is considered one of the main academic databases for evaluating scientific production worldwide (Merigó *et al.* 2015; Baier-Fuentes *et al.* 2019). WoS covers more than 15,000 journals and 50,000,000 articles (Merigó *et al.* 2015). Although alternative databases exist, the material included in WoS is expected to have the highest quality standards (Merigó *et al.* 2015).

Secondly, appropriate search terms were defined using search equations Topic: ("leader*" and "entrepre*"), combined with factors or skills by including all the relative terms: AND Topic: ("abilit*" or "capabilit*" or "attribut*" or "skill*" or "factor*" or "competenc*" or "behavior*" or "trait*" or "feature*"). The choice of these keywords was based on the literature review conducted by Harrison and Burnard (2016).

The third step was to define a broad time span from 2000 to 2020[1] to analyse the most recent articles, but over a sufficiently long period to understand the evolution of the literature in the field.

The fourth step was to narrow down the search to the WOS core collection using these indices: SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI, CCR-EXPANDED and IC.

The results were then refined by choosing only articles and reviews and, in order to not exclude countries of authorship, articles published in all languages were left out.

2.2. Results from de database

In all, 1,594 documents were obtained. They comprised 1,540 articles and 54 reviews, and 93% of the documents were in English.

3. RESULTS

3.1. Publications and distribution by year

The number of publications per year has increased in the last 20 years (see Figure 1). From 2000 to 2009, the subject of this research was of little interest based on the few collected articles. Publication activity increased from 2010 to 2014, with an average of almost 50 articles per year. This number tripled from 2015 to 2017, with an average of 150 publications per year. Growth has been considerable in the last 3 years with almost 250 articles written on average per year, and with 290 publications in 2020 alone. Thus the EL factors topic has attracted more interest in the scientific community from 2015 to 2020, and accounted for almost 75% of the articles published during that period. As Harrison and Burnard (2016) point out, there is little information on knowledge about these attributes and how they can help entrepreneurs to overcome challenges, and this growing interest is expected to continue and become a reality in forthcoming years.

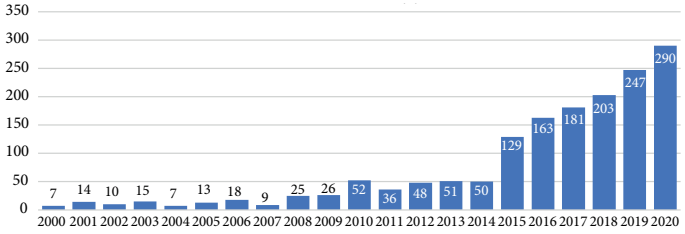

Figure 1
Distribution of documents published per year for research into entrepreneurial leadership factors (2000–2020)
Source: Authors' own elaboration based on data from the WoS.

3.2. Research terms evolution

Figure 2 shows the trend in the frequency of using the terms "entrepreneurial leadership" and "factors" as indicated by the abstracts of the 1,594 papers. A more significant and sustained increase took place from 2015 onwards. This is quite logical because it was from 2015 onwards when the literature in this field doubled.

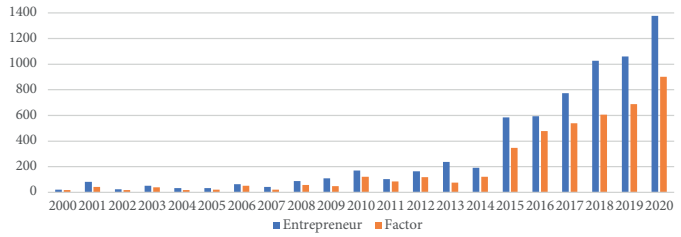

Figure 2
Annual evolution of the keywords "Entrepreneurial Leadership" and "Factor" (with derivatives and equivalents) in the abstracts (2000-2020)
Source: Authors' own elaboration based on data from the WoS.

3.3. Citation Structure

The overall citation structure allows us to analyse the number of documents in relation to a citation threshold (Cancino *et al.* 2017). Almost one third of the documents from the database received no citations. 73% of the publications received fewer than 10 citations, 27% received 10 citations or more, and only 10 documents received 300 citations or more (see Table 1).

Table 1
General citation structure

Citations	Total papers	%
≥ 300 citations	10	0.6
≥ 200 citations	22	1.4
≥100 citations	48	3.0
≥ 50 citations	106	6.6
≥ 20 citations	261	16.4
≥10 citations	435	27.3
< 10 citations	1159	72.7
= 0 citations	455	28.5
Total Papers	**1594**	**100.0**

Source: Authors' own elaboration based on data from the WoS.

[1] The date, the WoS database was consulted, was 13 January, 2021.

Table 2
Annual citation structure

Year	TP	TC	≥ 300	≥ 200	≥ 100	≥ 50	≥ 20	≥ 10	≥ 1
2000	7	628	0	2	2	3	4	6	7
2001	14	1570	1	3	5	6	10	11	12
2002	10	471	0	0	1	4	7	8	10
2003	15	2452	3	3	4	5	6	10	15
2004	7	1423	1	3	4	5	5	5	7
2005	13	204	0	0	0	0	3	8	12
2006	18	1410	1	1	4	10	11	11	18
2007	9	553	0	0	2	5	7	8	8
2008	25	1703	1	2	6	8	15	19	24
2009	26	538	0	0	1	3	8	10	23
2010	52	2162	0	4	6	13	28	33	51
2011	36	824	0	0	2	4	11	16	29
2012	48	1419	0	0	2	8	18	32	45
2013	51	1939	1	2	5	11	20	33	46
2014	50	1754	2	2	3	8	18	26	50
2015	129	1700	0	0	1	7	29	51	105
2016	163	1645	0	0	0	4	23	54	132
2017	181	1250	0	0	0	0	17	42	147
2018	203	1161	0	0	0	2	17	36	152
2019	247	698	0	0	0	0	4	16	157
2020	290	163	0	0	0	0	0	0	89
Total	**1594**	**25667**	**10**	**22**	48	106	261	435	1139
%	100		0.6	1.4	3.0	6.6	16.4	27.3	71.5

Note: Abbreviations: TP: Total Papers; TC: Total number of citations; Number of papers with ≥ of 200, 100, 50, 20, 10 and 1 citation/s.
Source: Authors' own elaboration based on the WoS with Excel.

Table 3
The five most cited documents in the WoS database

No.	TC	Title	Authors	Year	TC/Y
1	1040	A theory of entrepreneurial opportunity identification and development	Ardichvili, A; Cardozo, R; Ray, S	2003	58.0
2	758	The relationship of entrepreneurial traits, skill, and motivation to subsequent venture growth	Baum, JR; Locke, EA	2004	45.0
3	756	A model of strategic entrepreneurship: The construct and its dimensions	Ireland, RD; Hitt, MA; Sirmon, DG	2003	42.0
4	654	Culture and entrepreneurial potential: A nine country study of locus of control and innovativeness	Mueller, SL; Thomas, AS	2001	32.7
5	539	The big five personality dimensions and entrepreneurial status: A meta-analytical review	Zhao, H; Seibert, SE	2006	35.9

Note: Abbreviations: TC: See Table 2. TC/Y is the total no. of citations in the number of years.
Source: Obtained from VOS viewer software.

Table 2 shows that 2003 was the year with the most citations, with 2,452, followed by 2010 with 2,162. The most cited articles are normally located in the most remote years because an article needs a period from 3 to 7 years to obtain the most citations (Wang 2013). However, this baseline reveals that a portion of the most cited papers were located in the most recent years from 2013 to 2018. This indicates that researchers in the field publish papers that are attracting scholarly interest.

Table 3 shows the five most cited papers in the database. Authors like Ardichvili *et al.*; Baum *et al.*, Ireland *et al.* published these articles between 2003 and 2004. The first three articles exceeded 42 citations per year, and the first paper obtained 58.

3.4. The h-index and the most productive and cited authors

In this section, the h-index was employed to measure the scientific performance of the authors or that of the employed database. The h-index of the used database obtained a value of 73, which means that 73 articles were cited at least 73 times.

In relation to the more than 3,866 authors, Table 4 presents the 10 authors, and their respective institutions and country of origin, who published most of the articles related to the research topic. The most relevant authors were Pathak, Hmieleski, Urbano, Bagheri and Harrison, who stood out with nine articles for Pathak and seven publications for the rest. Of the 10 most published authors, Hmieleski received 760 citations and Pathak 443. Finally, three authors' h-index was higher than 20.

Table 4
The 10 most published authors in relation to entrepreneurial leadership factors

Author	TP	University	Country	TC	H	TC/TP	≥ 100	≥ 50	≥10	≥1
Pathak S	9	Xavier University, Ohio	USA	443	13	49.2	0	5	7	7
Hmieleski KM	7	Texas Christian University	USA	760	21	108.6	1	3	3	3
Urbano D	7	Autonomous University of Barcelona	SPAIN	127	31	18.1	1	2	6	7
Bagheri A	7	University of Tehran	IRAN	40	9	5.7	0	2	3	7
Harrison C	7	University of West Scotland	SCOTLAND	38	4	5.4	0	2	5	7
Obschonka M	5	Queensland University of Technology	AUSTRALIA	176	23	35.2	0	3	4	4
Chen MH	5	National Chung Hsing University	TAIWAN	44	13	8.8	0	2	5	5
Haslam SA	5	University of Queensland	AUSTRALIA	105	6	21.0	1	2	5	5
Wang ZM	5	Zhejiang University	CHINA	25	2	5.0	0	1	4	5
Muralidharan E	5	MacEwan University	CANADA	94	3	18.8	0	3	5	5

Note: Abbreviations: TP: Total Papers; TC: Total number of citations; H: Author h-index data base; H*: Author h-index (WoS).
Source: Authors' own elaboration based on the WoS with Excel.

Table 5
The first authors of the most co-cited papers in research

No.	Author (first only)	TC	TLS
1	Lumpkin gt, 1996, acad manage rev, v21, p135	132	128
2	Podsakoff pm, 2003, j appl psychol, v88, p879	125	124
3	Shane s, 2000, acad manage rev, v25, p217	113	108
4	Fornell c, 1981, j marketing res, v18, p39	106	106
5	Barney j, 1991, j manage, v17, p99	89	84
6	Gupta v, 2004, j bus venturing, v19, p241	82	80
7	Miller d, 1983, manage sci, v29, p770	77	76
8	Covin jg, 1989, strategic manage j, v10, p75	73	71
9	Teece dj, 1997, strategic manage j, v18, p509	71	71
10	Hambrick dc, 1984, acad manage rev, v9, p193	66	65

Note: Abbreviations: TC: Total number of citations; TLS: Total Link Strength.
Source: Obtained from VOS viewer software.

The most representative authors who were cited in the publications were Lumpkin (1996), Podsakoff (2003), Shane (2000), among others (see Table 5). It is noteworthy that seven of the 10 articles date before 2000, the year from which time this analysis was carried out.

3.5. Geographical distribution of the most productive and cited countries

Table 6 shows publishers' top 15 countries of origin from the most to the fewest papers, and the citations that they received. The USA was the most influential and productive country with 461 papers, followed by England with 163, China with 116, and Spain and Australia with 99 each. The citation structure differed from that of article production insofar as, although the USA and England were the countries with the most citations, Canada was the third, followed by Australia, Spain and Switzerland, and all above China.

From 2000 to 2008, the USA published an average of six articles per year. From 2009 to 2014, the average number of disclosed articles exceeded 18 units. It was in 2015 when the USA published an average of more than 47 articles by 2020. This three-stage growth pattern was replicated for countries like England, China, Spain, among others (see Table 7).

Table 6
The 15 most published countries in relation to entrepreneurial leadership factors

Country	TP	TC	H	TC/TP	≥ 300	≥ 200	≥ 100	≥ 50	≥ 20	≥ 10	≥ 1
USA	461	15327	57	33.2	9	18	33	66	133	186	274
ENGLAND	163	2648	30	16.2	0	0	6	11	41	66	99
CHINA	116	669	14	5.8	0	0	0	2	7	24	70
SPAIN	99	1698	17	17.2	1	1	3	7	16	29	52
AUSTRALIA	99	2064	23	20.8	1	1	2	10	25	43	60
GERMANY	88	1568	21	17.8	0	0	3	10	22	31	54
CANADA	84	2382	18	28.4	2	2	3	7	16	25	38
INDIA	49	126	6	2.6	0	0	0	0	1	3	26
MALAYSIA	48	449	9	9.4	0	1	1	2	4	9	25
ITALY	44	488	12	11.1	0	0	1	1	8	12	22
NETHERLANDS	43	857	11	19.9	1	1	1	2	8	12	20
FRANCE	41	845	11	20.6	0	2	2	3	10	13	29
SWEDEN	40	1603	13	40.1	1	2	5	5	10	17	22
RUSSIA	37	70	5	1.9	0	0	0	0	0	1	21
TAIWAN	31	328	8	10.6	0	0	1	1	4	7	11

Note: Abbreviations in Table 2. H: h-index research database.
Source: Authors' own elaboration based on the WoS with Excel.

Table 7
Evolution of documents per country for the 2000-2020 period

Country	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	Total
USA	4	8	8	6	5	7	8	3	14	9	23	17	18	27	18	32	42	41	52	60	59	461
ENGLAND	1	2	1	1	1	0	1	2	0	3	3	2	9	6	8	17	12	19	18	24	33	163
CHINA	0	0	0	1	0	0	0	0	0	0	0	1	4	0	3	6	8	10	14	26	43	116
SPAIN	1	0	0	0	0	1	2	1	1	0	2	2	4	4	6	4	9	15	13	17	17	99
AUSTRALIA	0	0	0	1	0	1	3	1	4	1	3	4	4	5	4	7	8	13	14	12	14	99
GERMANY	0	1	0	2	0	0	1	0	0	1	6	1	4	2	2	5	12	7	11	12	21	88
CANADA	0	0	0	1	0	1	1	1	3	1	2	4	1	2	5	7	8	9	10	14	14	84
INDIA	0	0	0	0	0	1	0	0	1	1	0	0	0	0	1	4	8	6	7	8	12	49
MALAYSIA	0	0	0	0	0	0	0	0	0	1	1	0	2	1	0	5	3	7	6	11	11	48
ITALY	0	0	0	0	0	0	0	0	2	0	3	1	2	1	1	6	3	3	5	4	13	44
NETHERLANDS	0	0	0	0	0	0	0	0	2	0	2	3	2	2	0	3	2	6	7	5	9	43
FRANCE	0	0	0	0	0	0	0	0	1	0	3	0	0	0	0	3	7	6	3	9	9	41
SWEDEN	0	1	0	1	0	0	0	1	1	0	1	0	1	7	1	4	2	4	7	5	4	40
RUSSIA	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	6	4	7	3	8	7	37
TAIWAN	0	0	1	0	0	2	0	0	0	0	1	1	1	0	3	4	1	3	5	6	3	31

Note: Abbreviations: 00, 01,02, 03, 04, 05, 06, 07, 08, 09, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20= year of publication.
Source: Authors' own elaboration based on the WoS with Excel.

3.6. Most productive and cited journals

The top three journals that have published articles related to the present research topic were: Sustainability, International Entrepreneurship and Management Journal and Journal of Business Venturing (see Table 8). However, the most cited journals were Journal of Business Venturing with 3,580 citations and 20 articles, followed by Journal of Management with 1,991 citations and nine articles.

Table 8
Citation structure of the sources that published the most

Journal	TP	TC	H	TC/TP	IF 2020	IF 5 years	% s/TP	≥ 300	≥ 200	≥ 100	≥ 50	≥ 20	≥ 10
Sustainability	28	116	5	4	3.251	3.473	1.8	0	0	0	0	1	3
International Entrepreneurship and Management Journal	21	277	8	13	5.940	6.458	1.3	0	0	0	2	5	6
Journal of Business Venturing	20	3580	16	179	12.065	15.732	1.3	2	7	9	13	16	18
Journal of Small Business Management	19	524	10	28	3.461	5.151	1.2	0	0	1	4	7	10
Journal of Business Research	16	357	11	22	4.544	6.799	1.0	0	0	0	2	6	11
Frontiers In Psychology	16	42	5	3	2.988	3.618	1.0	0	0	0	0	0	0
Management Decision	16	141	7	9	4.957	4.816	1.0	0	0	0	0	3	6
Entrepreneurship and Regional Development	14	399	7	29	5.149	6.142	0.9	0	0	2	2	6	7
International Journal of Entrepreneurial Behavior & Research	14	142	7	10	4.412	4.996	0.9	0	0	0	0	1	6
Journal of Management Studies	13	194	4	15	7.388	10.960	0.8	0	0	1	2	3	3
Journal of Product Innovation Management	12	671	10	56	6.987	9.603	0.8	0	0	2	5	9	10
Small Business Economics	11	181	6	16	8.164	8.139	0.7	0	0	0	2	3	5
Education and Training	11	63	3	6	2.275	2.948	0.7	0	0	0	0	2	2
Journal of Business Ethics	11	418	8	38	6.430	7.830	0.7	0	1	2	2	3	6
Journal of Social Entrepreneurship	10	34	3	3	NA	NA	0.6	0	0	0	0	0	1
Journal of Management	9	1991	9	221	11.790	16.662	0.6	3	3	5	7	8	8
Entrepreneurship Theory and Practice	9	492	7	55	10.075	15.191	0.6	0	0	1	4	7	7

Note: Abbreviations in Table 2; H: h-index research base; IF: Impact Factor; NA: not available.
Source: Authors' own elaboration based on the WoS with Excel.

Information on journals' IF is included. The top journals, Sustainability and International Entrepreneurship and Management Journal, had a low IF compared to the more influential journals Journal of Business Venturing and Journal of Management. The last two journals were the only ones with publications with at least 300 citations or more.

Table 9
Evolution of publications per journal during the 2000-2020 period

Journal	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	Total
Sustainability	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	3	7	11	4	28
International Entrepreneurship and Management Journal	0	0	0	0	0	0	0	0	0	0	0	0	1	1	3	1	1	2	2	4	6	21
Journal of Business Venturing	2	2	0	1	2	0	2	0	1	0	0	1	2	0	0	0	2	1	2	1	1	20
Journal of Small Business Management	0	0	0	0	0	0	1	1	1	0	2	0	0	0	0	3	1	1	0	7	2	19
Journal of Business Research	0	0	0	0	0	0	0	2	1	0	1	0	0	1	0	1	2	0	1	2	5	16
Frontiers In Psychology	0	0	1	0	0	0	0	0	0	0	0	0	2	1	1	4	1	0	2	2	2	16
Management Decision	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	1	3	9	16
Entrepreneurship and Regional Development	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	4	4	1	3	14
International Journal of Entrepreneurial Behavior & Research	0	0	0	0	0	0	0	0	0	0	2	1	1	1	0	0	2	1	2	2	2	14
Journal of Management Studies	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	1	9	13
Journal of Product Innovation Management	0	0	0	0	0	0	1	0	1	1	0	0	2	1	4	0	0	1	0	0	1	12
Small Business Economics	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	2	0	1	2	1	4	11
Education and Training	0	1	0	0	0	0	0	0	0	0	3	0	1	0	0	0	2	0	2	1	1	11
Journal of Business Ethics	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0	1	4	3	11
Journal of Social Entrepreneurship	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	0	6	1	10
Journal of Management	0	0	0	2	0	0	0	0	0	0	0	0	1	1	1	2	1	0	0	1	0	9
Entrepreneurship Theory and Practice	0	0	0	0	0	0	0	0	1	0	0	1	2	1	0	1	0	0	0	1	2	9
Academy of Management Perspectives	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2	5	8

Note: Abbreviation in Table 7.

Source: Authors' own elaboration based on the WoS with Excel.

Based on the evolution of publications over time (see Table 9), the Journal of Business Venturing has published articles regularly since 2000, with an average of one article per year. Other journals, such as the International Entrepreneurship and Management Journal, did not start publishing until 2012, or until 2015 for the journal Sustainability. From this time onwards, publications were more assiduous and increased until they became the journals with the most published documents.

3.7. Research per category

In terms of WoS categories, slightly more than 33% and slightly less than 33% of the articles fell in the Management and the Business category, respectively (see Figure 3 and Table 10). Although the entrepreneurship and leadership fields began as separate areas, three decades ago several scholars drew parallels between these two domains both historically and conceptually (Lippitt 1987; Vecchio 2003; Gupta *et al.* 2004; Renko *et al.* 2015; Harrison and Burnard 2016). This concordance has more recently led to the discovery of an intersection between entrepreneurship and leadership that has benefited from mutual cross-fertilisation (Cogliser and Brigham 2004; Renko *et al.* 2015; Leitch and Harrison 2018; Karpinskaia and Shirokova 2019), and may justify such ambiguity in classifying it into different categories.

Seven articles exceeded 300 citations for the Management category and six for the Business category. The Applied Psychology category stood out with six publications and more than 300 citations.

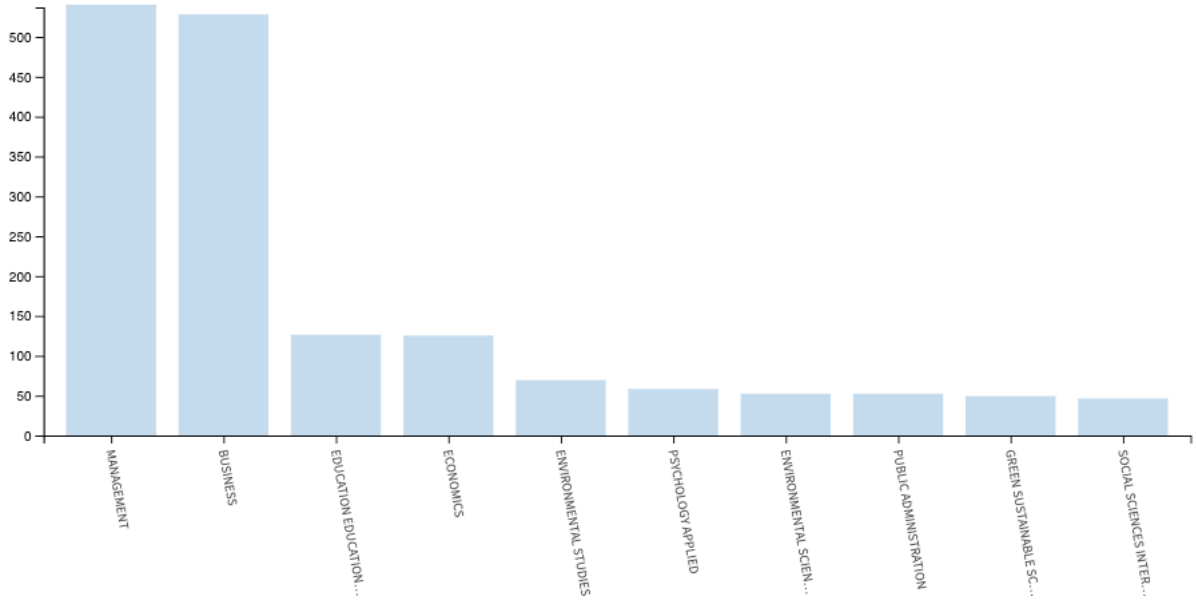

Figure 3
Distribution of categories (2000-2020)
Source: Obtained from the WoS.

Table 10
Main categories in the WoS and citation structure

WOS category	TP	%	TC	H	TC/TP	≥ 300	≥ 200	≥ 100	≥ 50	≥ 20	≥ 10	≥ 1
Management	534	33.5	12826	52	24	7	11	26	58	125	200	422
Business	524	32.9	13918	56	27	6	15	31	61	132	196	406
Education & Educational Research	123	7.7	871	14	7	0	0	1	4	10	19	72
Economics	122	7.7	820	17	7	0	0	0	3	12	26	77
Environmental Studies	66	4.1	984	16	15	0	1	2	4	12	23	54
Psychology, Applied	55	3.5	4528	22	82	6	6	11	17	23	26	46
Public Administration	49	3.1	902	15	18	0	0	1	6	13	19	43
Environmental Sciences	49	3.1	981	14	20	1	1	1	3	11	14	39
Green & Sustainable Science & Technology	46	2.9	286	8	6	0	0	0	1	5	7	33
Social Sciences, Interdisciplinary	43	2.7	162	7	4	0	0	0	0	2	5	28

Note: Abbreviations in Table 2.
Source: Authors' own elaboration based on the WoS with Excel.

Table 11
Main research areas and citation structure

Research Area	TP	%	TC	H	TC/TP	≥ 300	≥ 200	≥ 100	≥ 50	≥ 20	≥ 10	≥ 1
Business & Economics	920	57.7	19997	67	22	9	2	41	85	188	303	691
Education & Educational Research	144	9.0	1070	16	7	0	0	1	4	14	25	91
Psychology	113	7.1	5006	28	44	6	6	11	19	30	40	90
Social Sciences - Other Topics	100	6.3	909	16	9	0	1	2	2	11	23	67
Environmental Sciences & Ecology	84	5.3	1701	18	20	1	2	3	7	18	30	68
Engineering	72	4.5	1723	24	24	0	0	4	11	27	33	59
Public Administration	71	4.5	1146	19	16	0	0	1	6	19	29	58
Science & Technology - Other Topics	66	4.1	319	8	5	0	0	0	1	5	8	46
Government & Law	41	2.6	800	14	20	0	0	1	7	11	16	32
Development Studies	36	2.3	668	14	19	0	0	2	3	9	16	29

Note: Abbreviations in Table 2.
Source: Authors' own elaboration based on the WoS with Excel.

In Table 11, categories are analysed per research area. Business & Economics is the main category with 920 publications and almost 20,000 citations in all. It is followed by Education & Educational Research, Psychology and Social Sciences.

3.8. Analysis of graphic maps

This section aims to present an analysis of scientific graphical maps based on bibliographic data using the VOSviewer software.

A. Co-citation of journals and authors

Figure 4 analyses the co-citation of the journals cited in the database. Journal co-citation occurs when two papers published in different journals receive a citation from a third paper in another journal (Merigó *et al.* 2018). This reveals the possibility of a paper B and a paper C cited by a paper A addressing the same topic (Blanco-Mesa *et al.* 2017). The more citations the two papers receive in the same article, the closer their relation (Small 1973). The more published documents, the larger the node size. The shorter the distance between nodes, the higher the citation frequency, and *vice versa* (Liao *et al.* 2018). Figure 4 presents the overall visualisation with a minimum threshold of 150 citations to obtain 73 sources with 300 connections. Three clusters of journals are clearly observed when papers have high co-citations, which reveals strong connections: Academy of Management Journal, Academy of Management Review and Strategic Management Journal (red); Journal of Business Venturing (green) and Journal of Applied Psychology (blue). To a lesser extent, there are the clusters with Entrepreneurship Theory and Practice (purple) and Journal of Product Innovation Management (yellow).

Figure 5 is a bibliometric map on which co-citation connections are established between authors to form 11 thematic clusters. The author co-citation analysis (White and Griffith 1981) aims to show the structure and connections of the authors who are most frequently cited together (Gaviria-Marin *et al.* 2019). In the main node, we find Hmieleski as an influential author in EL research. This is evident because he is the author with the most received citations and with seven articles written on the impacts of leadership on entrepreneurship performance. In node 2, we note Obschonka with five articles and 176 citations. Node 3 shows Bagheri (7 articles 40 citations) and Harrison (7 publications, 38 citations). These authors have focused their study on the intentions, skills, competencies and abilities that form part of EL. The last two authors have even proposed a multidimensional measurement construct of EL. In node 4, Pathak stands out (9 publications, 443 citations) for focusing on the impact of the cultural context in the field. In node 11, Urbano is highlighted with his studies on entrepreneurship internationally, in university contexts, etc.

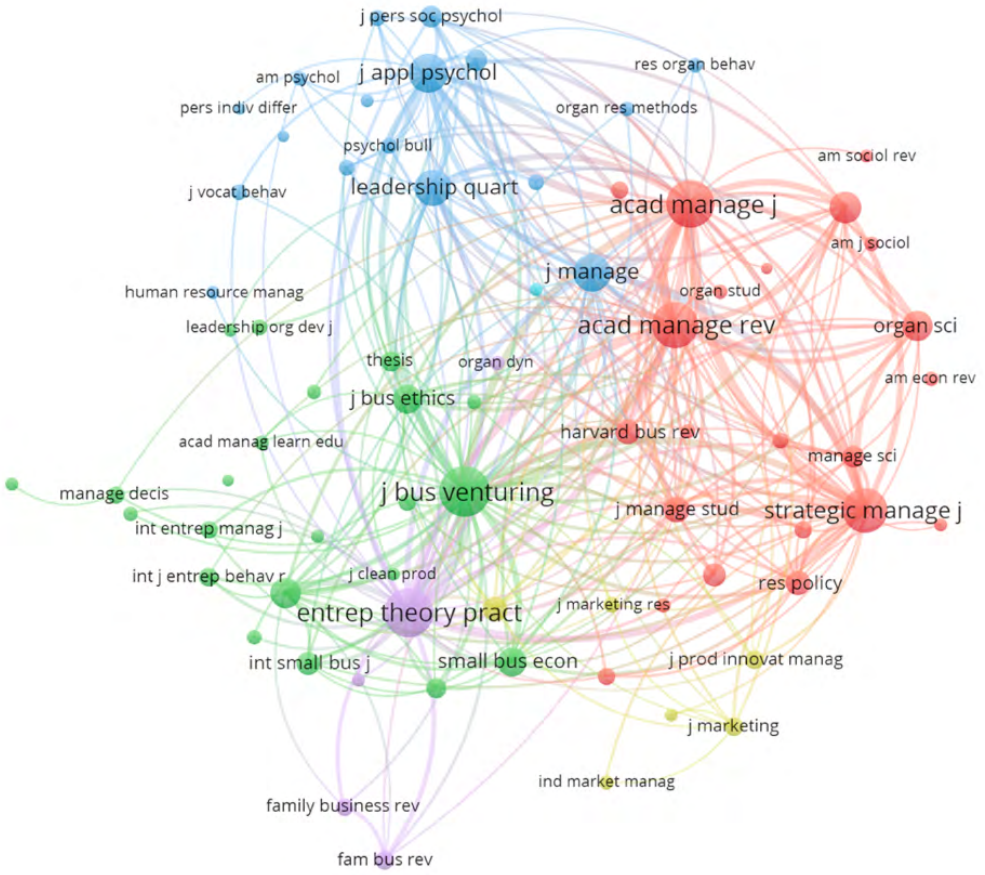

Figure 4
Co-citation of journals
Source: Obtained from VOS viewer software.

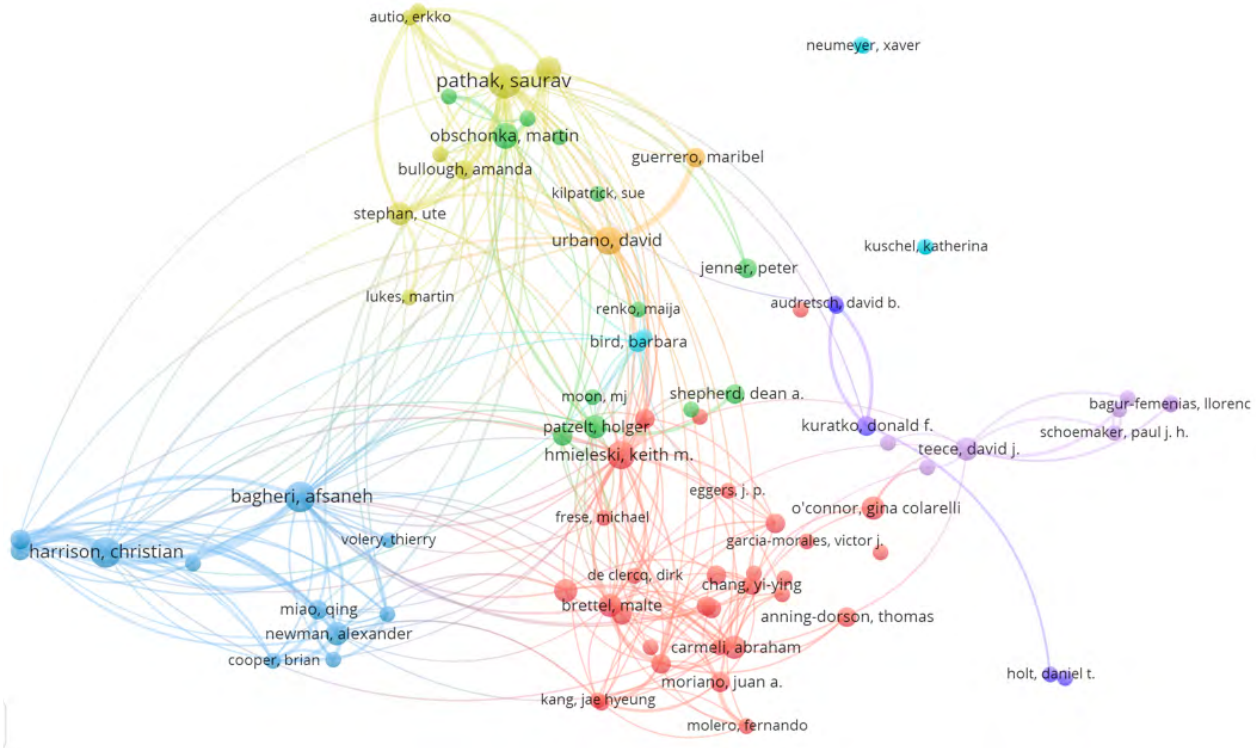

Figure 5
Co-citation of authors
Source: Obtained from VOS viewer software.

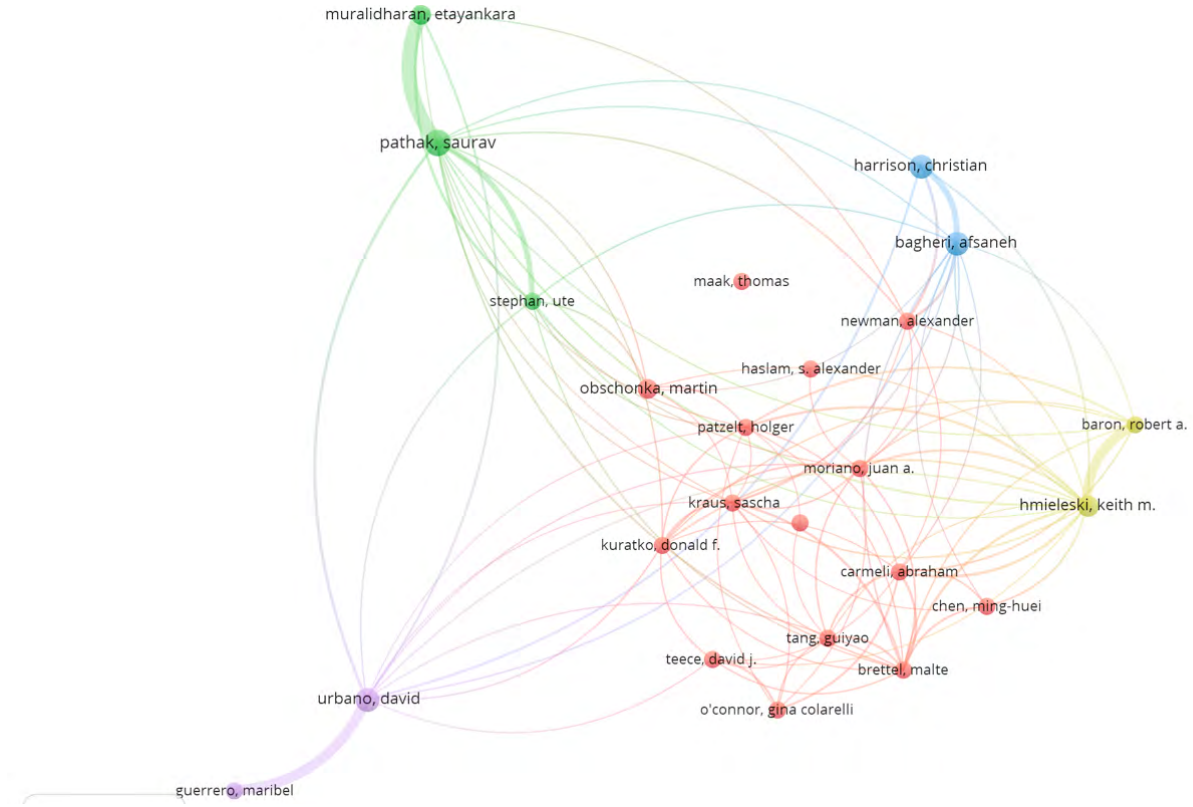

Figure 6
Bibliographic coupling of authors
Source: Obtained from VOS viewer software.

B. Bibliographic coupling by authors and countries

Bibliographic coupling of authors occurs when the authors of two papers cite the same third paper. Hence both are stated to be bibliographically coupled. The larger the number of common bibliographic references, the greater the intensity of their relation (Kessler 1963).

Figure 6 presents the 24 authors with a minimum threshold of four papers per author, which also shows the 100 strongest bibliographic coupling connections. The advantage of this figure is that it provides a graphical mapping of authors by grouping those with similar research profiles, i.e. those citing similar bibliographic material. The five most important clusters are shown: the red cluster indicates the highest concentration of connections, but with medium intensity between authors like Brettel, Carmeli, Chen, Kuratko, Obschonka, among others. The green cluster is formed by productive authors Pathak, Muralidharan, Stephan, with a strong intensity among them. The blue cluster is made up of Bagheri and Harrison, the yellow cluster contains Hmielsinki and Baron and, finally, the purple cluster is formed by Urbano and Guerrero. This strong intensity, marked by the thick lines connecting them, shows that these authors may have similar, or even joint, research lines. This is the case of: Pathak and Muralidharan with five joint articles; Urbano and Guerrero with four; Bagheri and Harrison or Pathak and Stephen with one.

Figure 7 presents the graphical map of the bibliographic coupling among the main countries. It depicts interesting relationships among them. This map has a threshold of six documents per country and 100 connections. Although many clusters were obtained, the USA was bibliographically coupled with England, China and Canada and, to a lesser extent, with Spain and Germany.

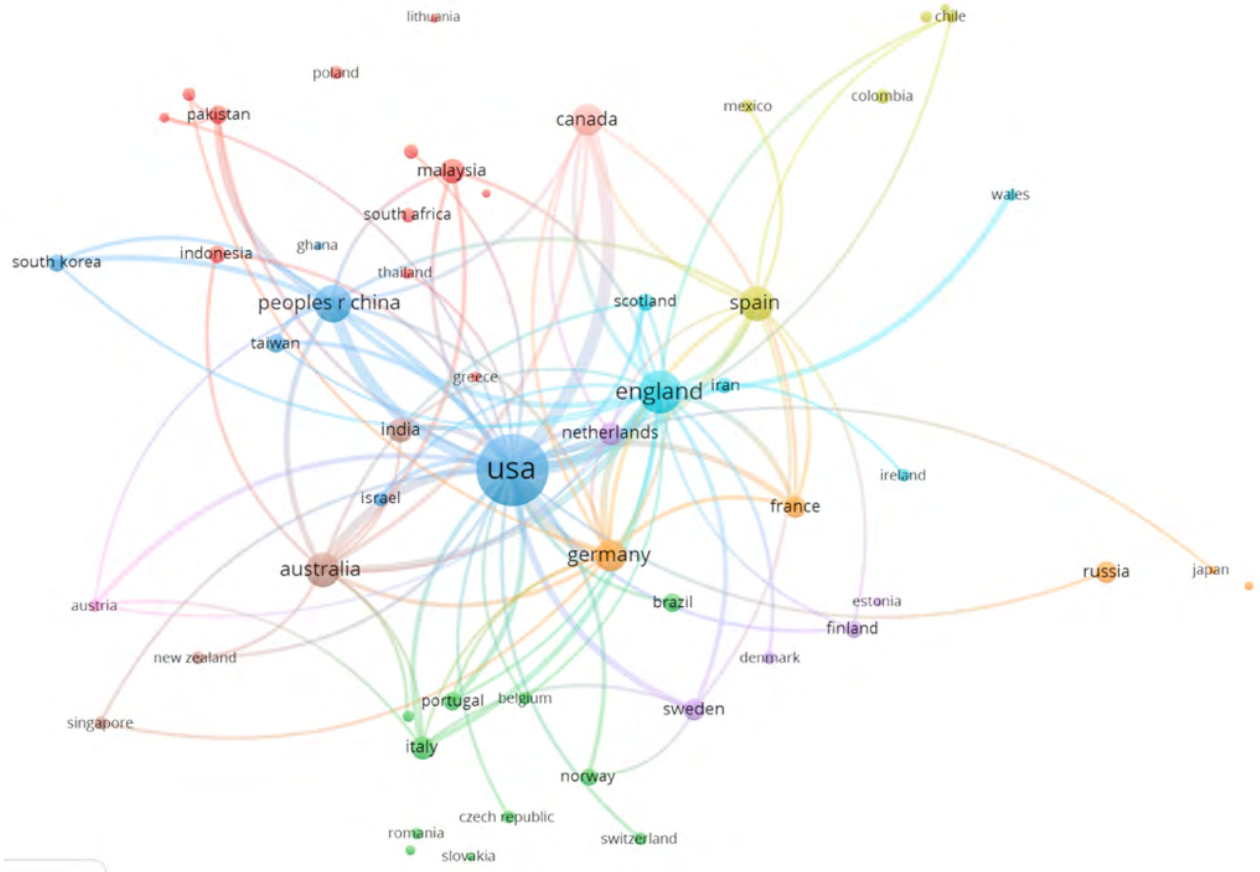

Figure 7
Bibliographic coupling by countries
Source: Obtained from VOS viewer software.

C. Co-authorship per country

Figure 8 shows the co-authorships per country by identifying the degree of communication and scientific collaboration among them and the most productive countries (Merigó *et al.* 2018). The graphical map is obtained with a threshold of at least six articles per country. The largest nodes are the most influential countries, i.e. the USA, England and, to a lesser extent, China, Spain, Germany, Australia and Canada. The relationship lines represent cooperation between countries. It can be concluded that the USA has considerably cooperated with Canada and China and, to a lesser extent, with Australia, Germany, Spain, among others.

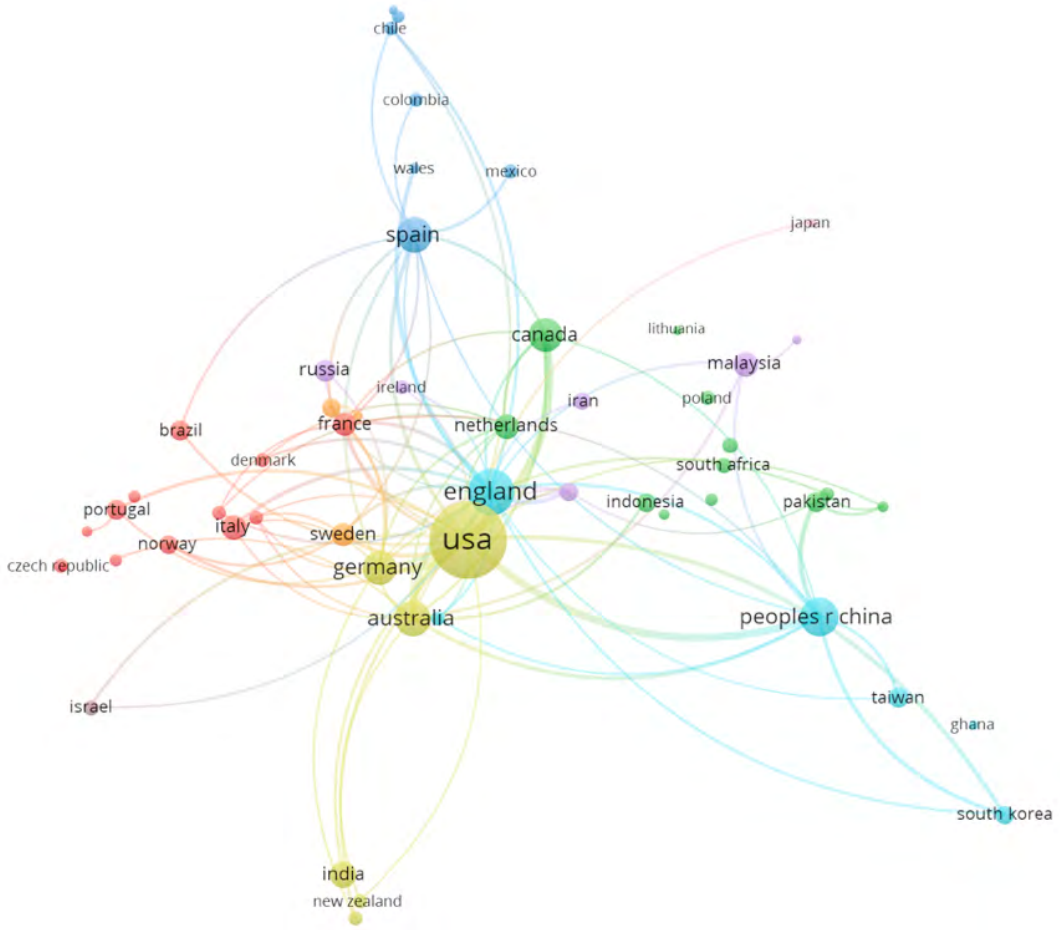

Figure 8
Co-authorship per country
Source: Obtained from VOS viewer software.

D. Co-occurrence per keywords

By collecting keywords, a content analysis can be carried out to provide quantitative measures. This method has potential when discovering emerging fields (Ellegaard and Wallin 2015). Therefore, the main keywords in the document base are analysed with the co-occurrence of keywords of two types: Author keywords, provided by the authors themselves; KeyWords Plus (KW+), taken automatically by SSCI[2], based on the frequency of words occurring in the titles of the references of the cited articles.

Table 12 shows the top 10 keywords with the highest frequency, i.e. the most occurring ones with the total link strength with other keywords by selecting those with the greatest total link strength (TLS). These are: entrepreneurship, leadership, innovation, social entrepreneurship, entrepreneurial leadership, entrepreneurial orientation, sustainability, transformational leadership, among others.

Figure 9 shows a visualisation of the Author keywords overlaid with their average year of publication using colours to represent their temporal variation. The dark blue terms were published around 2016 on average, are those with an average year of publication around 2017.5 are shown in green, and the keywords with an average year of publication around 2018 are depicted in yellow.

Table 12
Co-occurrence of the top 10 author keywords

No.	keyword	occurrences	Total Link Strength
1	Entrepreneurship	198	122.00
2	Leadership	155	112.00
3	Innovation	98	76.00
4	Social entrepreneurship	48	28.00
5	Entrepreneurial leadership	43	22.00
6	Entrepreneurial orientation	36	28.00
7	Sustainability	29	22.00
8	Transformational leadership	28	24.00
9	Entrepreneurs	28	19.00
10	Gender	27	22.00

Source: Obtained from VOS viewer software.

[2] Social Sciences Citation Index

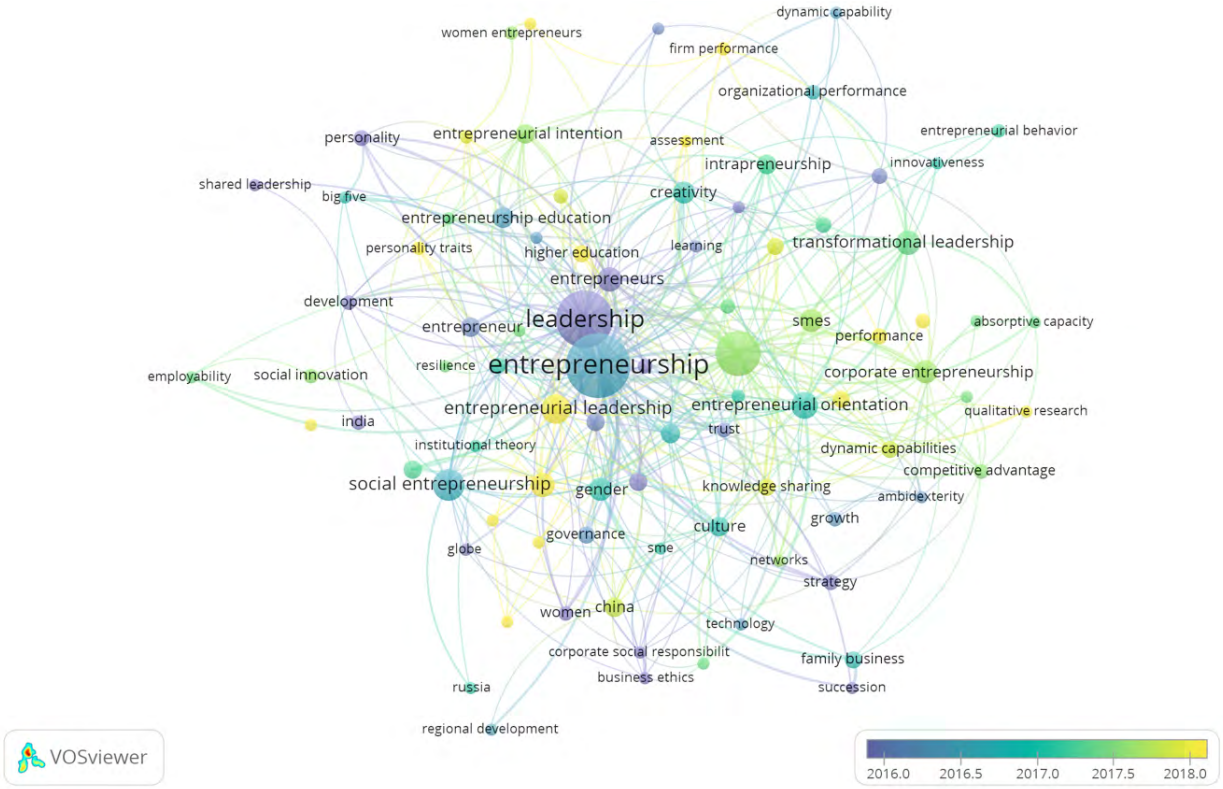

Figure 9
Co-occurrence of author keywords with overlay visualisation
Source: Obtained from VOS viewer software.

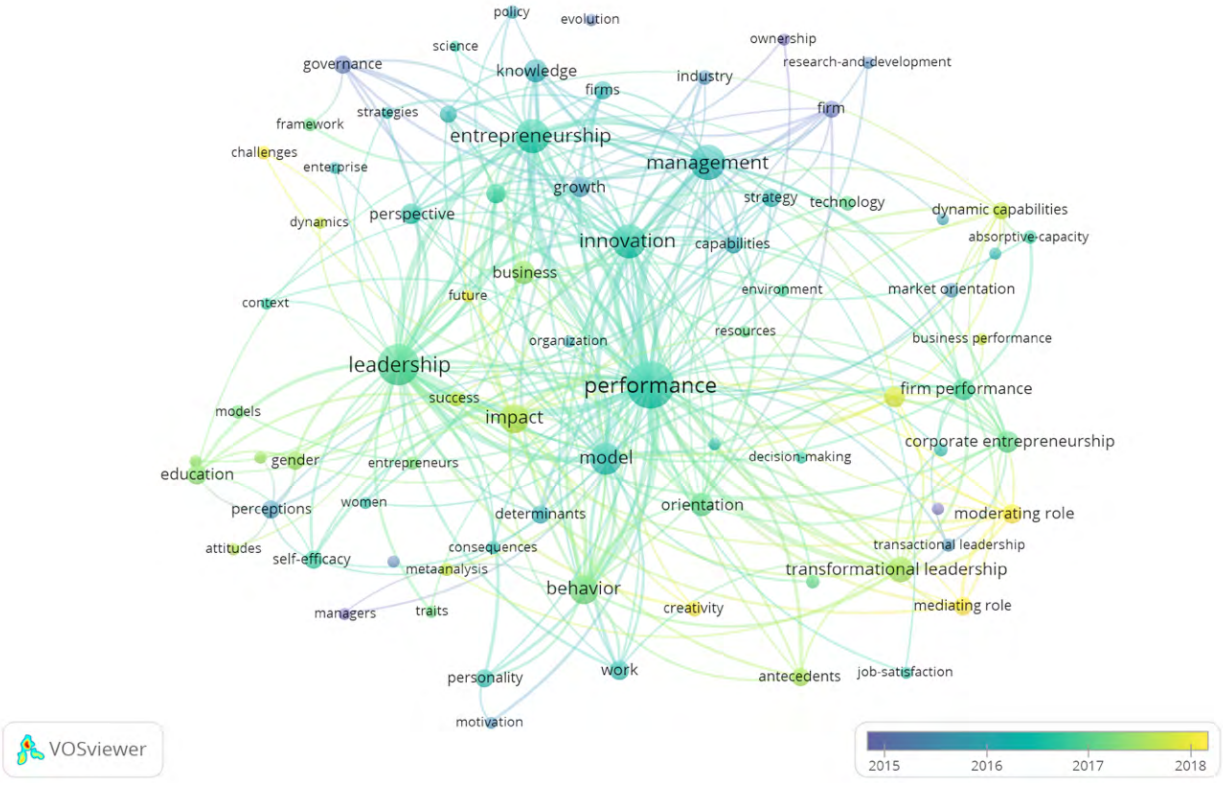

Figure 10
Co-occurrence of Plus keywords with the overlay visualisation
Source: Obtained from VOS viewer software.

The terms leadership, entrepreneur, woman, personality and development had a publication average immediately prior to 2016. Roughly halfway through 2016, the words entrepreneurship, social entrepreneurship, creativity, social capital, growth and entrepreneurship orientation stood out. The items innovation, intrapreneurship, transformational leadership, corporate entrepreneurship, culture, competitive advantage, entrepreneurial intention or self-efficacy were published on average about halfway through 2017. From 2018 onwards, the term "entrepreneurial leadership" appeared. All this is interesting because it means that the research community is beginning to consider this "new paradigm" as a field in its own right. Other items are highlighted, such as sustainability or university education. However, the most remarkable emerged around the end of 2017 and 2018, when EL factors appeared in the literature, such as: personality traits, competences, skills, evaluation, self-efficacy, innovative behaviour, servant leadership, market orientation, social networks, performance, dynamic capabilities, among others.

In Figure 10 below, KW+ were selected because these units of analysis better reflect the dynamics of the field, and they are up-to-date, more specific and higher quality terms compared to Authors' keywords (Gálvez 2016). For a representative sample of the thematic groups, only the KW+ whose frequency was ≥20 times were selected; i.e. those occurring in the scientific output at least 20 times. The most recent ones in lime green and yellow depict performance, transformational leadership, dynamic capabilities, impact and creativity, among others.

4. DISCUSSION AND CONCLUSIONS

4.1. Lessons learnt

This study aims to contribute to the field of research into EL factors by providing an overview of the landscape and a precise focus through a detailed bibliometric analysis. Using the two main bibliometric methods, performance analysis and scientific graph mapping, the main authors were identified, as were the countries and journals researching it, trends in publications and the interrelationships among them. The results were obtained by analysing a bibliographic database obtained from the WoS core collection, which is considered the most influential in the scientific community.

The bibliometric study generally revealed that the number of research studies related to EL factors has increased since 2015, which confirms that this emerging field is attracting researchers' considerable interest. This is because it is vital to identify and better understand which leadership attributes are considered the most valuable in entrepreneurship to successfully manage it (Cogliser and Brigham 2004; Gupta *et al.* 2004; Fernald *et al.* 2005). It was also from 2015 onwards when the use of the terms EL and leadership factors in entrepreneurship began to develop and notably grow.

However, almost 73% of the papers indexed in the WoS database have received less than 10 citations. This finding reflects that it is still necessary to disseminate more knowledge and to generate impact for future research. In contrast, the most cited papers appeared in the most recent years, from 2013 to 2018. This reinforces the assertion that researchers in this field publish papers that arouse the scientific community's recent interest.

Five authors have published seven papers or more on this topic: Pathak (USA), Urbano (Spain), Bagheri (Iran), Harrison (Scotland) and Hmieleski (USA). Hmieleski and Pathak are the most cited, and in that order. Bibliographic coupling per authors revealed strong connections between authors, who focus on similar, or even joint, research lines. This was the case of the co-authorships between Pathak and Muralidharan, Urbano and Guerrero, Bagheri and Harrison, among others. According to the study of co-citations per authors, the node with Hmieleski stood out for being an influential author with articles written in the field of impacts of leadership on entrepreneurial performance. Obschonka, and Bagheri and Harrison stood out for publishing studies that focus on the intentions, skills, competencies and abilities that form part of EL. In another node, Pathak has centred on the impact of cultural context on EL.

The USA is the leader in productivity and influence terms with 29% of published documents and more than 15,327 citations. It was followed by England with 10% of publications and 2,648 citations. China, Australia and Spain followed for number of published articles, and were followed by Canada and Australia for citations. The productivity and influence of many countries has increased because several research groups have been created, which is reflected in the bibliographic coupling per country. The United States was clearly coupled with England, China and Canada and, to a lesser extent, with Spain and Germany. For co-authorship per country, the USA cooperates with Canada and China and, to a lesser extent with Australia, Germany and Spain. Both the publications of, and influence on, these countries have considerably grown in recent years.

The top three journals in productivity terms were Sustainability, International Entrepreneurship and Management Journal and Journal of Business Venturing. However, the most influential journals for being the most cited and with the highest IF and h-index in research were Journal of Business Venturing, followed by Journal of Management, Journal of Product Innovation Management, Journal of Small business Management and Entrepreneurship Theory and Practice. Once again, the graphical mapping and citation analysis of the journals reinforced these results. These results are understandable because of a general researchers' tendency to consider the publications of these journals as being the most prestigious.

Slightly more than 33% of the articles fell in the Management category and slightly less than 33% in the Business category due to the existing ambiguity that indistinctly associates EL with the entrepreneurship and leadership fields. This ambiguity is reflected in the co-citation per journals in which more than three clear thematic clusters appeared: management journals, business journals and psychological journals.

The trends obtained from the temporal evolution of using Authors' keywords have recently focused on the study of EL factors. Furthermore, the EL term started being used in its own right from about 2018 on average.

4.2. Main Limitations

We remind readers that the information herein presented is primarily descriptive and provides a general orientation of the field in relation to the several analysed dimensions.

Another limitation is that these results came from the WoS core collection database. Although this database is considered one of the most influential, it may have some limitations. Firstly, it uses the complete count of all the participating units of a paper. Therefore, papers with several co-authors perform better than single-authored papers because they are not broken down according to number of authors. Secondly, this analysis measures publications by considering the institutions and countries of the authors publishing in the journal and their affiliation at the time of publication, and does not take into account whether the author has retrospectively changed institution.

Finally, the results represent the overall picture available until 2020. This means that these results may evolve differently from that expected in the future because they are dynamic data.

4.3. Future research lines

Future research lines include the need to explore this field from a gender lens to confer it a more pluralistic approach. Although the literature on female entrepreneurship has developed in recent decades, and the research emphasis has shifted from predominantly descriptive explorations to studies that integrate empirical res0earch (Henry *et al.* 2016), gender issues have rarely been acknowledged in this emerging field (Harrison *et al.* 2015).

Another possible research direction is to analyse other databases, such as Scopus or Google Scholar, to obtain a more plural broader base because, although it is clear that some countries have only a few publications on the subject, it does not mean that they are not producing countries.

Finally, given the many identified research areas (e.g. economics and business, management, education, psychology, etc.), it could be interesting to investigate how these areas intertwine and originate. For researchers, understanding what is being researched and where research is going in the knowledge field are extremely valuable.

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