
Organisational ambidexterity: a literature review using bibliometric methods

Francisco García-Lillo*,
Mercedes Úbeda-García and
Bartolomé Marco-Lajara

Department of Management,
University of Alicante,
Alicante, Spain
P.O. Box 99, E-03080, Alicante, Spain
Email: f.garcia@ua.es
Email: mercedes.ubeda@ua.es
Email: bartolome.marco@ua.es

*Corresponding author

Abstract: The present research work shows the results of an analysis about the existing literature on one of the ‘topics’ which is currently raising great interest among scholars and researchers in the fields of strategic management and organisation science, namely: organisational ambidexterity. More precisely, and seeking to identify and visualise the intellectual structure or knowledge base of the research developed in relation to this construct, a decision was made to analyse a total of 283 research papers which appeared after the publication in the journal *California Management Review* in the summer of 1996 of the seminal work by Tushman and O’Reilly III entitled ‘Ambidextrous Organizations: Managing Evolutionary and Revolutionary Change’, where these authors suggested that organisations need to explore and exploit simultaneously if they want to be ambidextrous. As for the methodology applied, it was based on the utilisation of bibliometric techniques – particularly citation analyses and author co-citation analyses (ACA) – and social networks analysis (SNA).

Keywords: organisational ambidexterity; organisation theory; exploration; exploitation; bibliometrics; citation analysis; author co-citation analysis; ACA; social networks analysis; SNA.

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Biographical notes: Francisco García-Lillo is a Senior Lecturer of the Business Organization Department at the University of Alicante (Spain). He has a PhD in Business and Economic Sciences. His research interests are focused on the fields of strategic management, human resources management (HRM), entrepreneurship, and the organisation theory.

Mercedes Úbeda-García holds a PhD in Economic and Business Sciences at the University of Alicante. She is a lecturer and a researcher in the fields of strategic management and human resources management (HRM).

Bartolomé Marco-Lajara is the Vice-Dean of the Faculty of Economic and Business Sciences at the University of Alicante (UA), where he is a lecturer too. He has a PhD in Economic and Business Sciences. His research has been developed in the fields of strategic management, alliances, and human resources management (HRM).

1 Introduction

Organisational ambidexterity, defined by O'Reilly and Tushman (2013) as “the ability of an organization to both explore and exploit – with the aim of competing in mature technologies and markets where efficiency, control, and incremental improvement are prized and to also compete in new technologies and markets where flexibility, autonomy, and experimentation are needed” (p.324), and regarded by these same authors as a dynamic capability (O'Reilly and Tushman, 2008, 2013), has strongly emerged as a central research stream in organisation science when trying to find an answer to the question: “how are organizations able to survive in the long term?”

To start with, having already become familiarised with the study of organisational ambidexterity, it would firstly seem advisable for us to state that the use of the aforesaid construct by scholars and researchers in the academic literature has traditionally been based on adopting a variety of analysis perspectives for the purpose of identifying those organisations which show a certain skill to explore new opportunities while contemporarily exploiting already existing capabilities (amongst others, Benner and Tushman, 2003; Birkinshaw and Gupta, 2013; Gibson and Birkinshaw, 2004; Gupta et al., 2006; He and Wong, 2004; O'Reilly and Tushman, 2008, 2013; Tushman and O'Reilly, 1996); in other words, which are capable of internally offsetting or balancing certain tensions while simultaneously managing to achieve aims that are apparently contradictory to each other: ‘alignment’ vs. ‘adaptability,’ ‘flexibility’ vs. ‘efficiency,’ ‘stability’ vs. ‘change,’ and ‘exploitation’ vs. ‘exploration’ (Adler et al., 1999; Gibson and Birkinshaw, 2004; Nosella et al., 2012).

With regard to the most important lines of research or fields of study around this perhaps new ‘paradigm’ in the context of the ‘organisation theory’, toward which research might evolve – a possibility mentioned by authors such as Raisch and Birkinshaw (2008, p.376) – researchers’ efforts seem to have essentially focused on analysing its antecedents, moderating elements, and environmental influences – such as its high dynamism – as well as the effects on the ‘performance’ of organisational ambidexterity while contemporarily doing research on the different ways to achieve it; in short, on offsetting or trying to find a balance between ‘alignment’ (exploitation) and ‘adaptability’ (exploration).

In connection with the above, organisations regarded as ambidextrous can achieve the aforesaid balance between exploratory and exploitative processes in a variety of ways. One first way would be the utilisation of what is known as ‘sequential ambidexterity.’ For example, Siggelkow and Levinthal (2003) suggest that sequencing changes in the organisational structure to promote temporary decentralisation can be an effective way of exploring and exploiting. The ‘balance’ mentioned above could also be achieved by means of what is referred to as ‘architectural’ or ‘structural’ ambidexterity – also known as ‘partitional’ – in the literature. It consists in providing the organisation with a dual

organisational structure where some units would be specialised in explorations and others in exploitation; and these units would in turn have different competences, incentive systems, processes and cultures —each one of them internally aligned [O'Reilly and Tushman, (2008), p.192]. Finally, contextual ambidexterity, defined as the conductual ability to show alignment – exploitation – as well as adaptability – exploration – throughout a business unit [Gibson and Birkinshaw, (2004), p.209] could appear as a third way to reach such a balance. Unlike structural ambidexterity, this last type of ambidexterity – the 'contextual' one – is not obtained through the definition of dual structures but developing a series of systems or processes which allow or encourage individuals to judge by themselves what is the best way to divide their time as well as the resources which are available to them between exploratory and exploitative activities; ambidexterity thus becomes a capability which manifests itself in individuals rather than in the organisational structure itself (O'Reilly and Tushman, 2013).

In any case, if the previously listed 'ways' to achieve ambidexterity have something in common, that is the adoption of an internal perspective. Nevertheless, a new more recent analysis perspective seems to be emerging according to which ambidexterity is analysed through the adoption of a broader perspective that goes beyond organisational boundaries (Kauppila, 2010; Kristal et al., 2010; Lavie et al., 2010; Russo and Vurro, 2010; Stettner and Lavie, 2014; to quote but a few). In short, an approach or perspective where the firm (or corporation) stops being seen as the central unit of analysis, a role that now corresponds to the 'ecosystem' of which the firm is a part – by way of example, it has been proposed from the theoretical perspective of social networks that ambidexterity can be attained by means of strategic alliances between firms and inter-organisational networks able to combine exploratory and exploitative capabilities between different units and at different points in time (Lavie and Rosenkpf, 2006; Lavie et al., 2011; amongst others).

In particular, the research developed here not only allowed us to delimit the different lines or streams of research which shape the 'intellectual structure' of research on organisational ambidexterity – the goal of our work together with showing the highly multidisciplinary nature of the research performed in connection with such construct – but also offered sufficient evidence about the existence or presence of this other analytical 'front' or 'perspective' that authors such as Nosella et al. (2012) call 'cross-boundary' perspective.

Our paper is structured as follows. The next section – Section 2 – deals with the collection of data that will subsequently be analysed from the source or database considered the most suitable one and with the methodology utilised. The outcome of the co-citation analyses and author co-citation analyses (ACAs) performed, together with a graphic representation or visualisation of the knowledge base or 'intellectual structure' mentioned in the preceding paragraph, that is, of the research carried out in relation to the construct examined, are shown in Section 3 – after which a final section serves to summarise the main conclusions and limitations of this research work.

2 Data and methods

The primary database from which were obtained the source documents used to carry out the present research study was the one developed by the Philadelphia Institute for

Scientific Information (ISI): the Social Sciences Citation Index® (SSCI), available online through the Web of Science (WoS).

In particular, and with a view to identify and visualise the intellectual structure or knowledge base of the research on organisational ambidexterity, it was decided to analyse a total of 283 research papers¹ about that construct which appeared after the publication in the journal *California Management Review* in the summer of 1996 of the seminal work by Tushman and O'Reilly III entitled 'Ambidextrous Organisations: Managing Evolutionary and Revolutionary Change,' where these authors suggested that organisations need to explore and exploit simultaneously if they want to be ambidextrous. The total number of cited references included in these papers amounted to 20,765, the resulting mean being 73.4 references per paper.

In relation to the above, it is worth highlighting that attention was exclusively paid to 'journal papers', that is, to research papers – instead of books, doctoral dissertations, or reviews and proceedings papers – since only these journal papers can be considered 'certified knowledge,' a term used to describe knowledge which has been subjected to the critical review of other researchers in order to gain their approval and which has resisted their objections (Callon et al., 1993). The use of citations coming from research papers additionally constitutes a standard practice adopted in this type of study for the purpose of increasing the validity level of the results obtained.

The documents retrieved were directly downloaded in plain text format (.txt) in order to be treated, after their conversion, through Bibexcel®, a public domain software program which can be downloaded on the internet for free. This software was specifically developed by Professor Olle Persson at the Institute of Information Sciences of the Swedish University of Umeå for the handling and treatment of bibliographic records.

Amongst many other functionalities, Bibexcel® offers the possibility to combine the information extracted from different fields of a bibliographic record, including the cited references field, to perform frequency counts and to analyse co-occurrence between various elements (authors, documents, journals, words, etc.), as well as the implementation of bibliographic coupling techniques.

In our case, the aforementioned software was used not only to carry out frequency counts for the citations contained in each one of the documents examined but also to generate the author co-citation matrix, after having pre-processed the data and established the cutoff point or citation threshold. The approach to the intellectual structure meant to be represented from the vision provided by social networks analysis (SNA) was based on the utilisation of the matrices previously generated with the Bibexcel® program for their treatment with Pajek® – their visualisation or reticular representation being carried out by means of VOSviewer®. As for the different multivariate analyses performed, they were developed through the use of the statistical package SPSS® v.21.

At this stage, it is worth pointing out that the analysis of scientific maps cannot be directly applied to the data collected in gross format from the bibliographic databases; a previous pre-processing of those data is actually required. These data usually contain a large number of errors and inconsistencies mainly referred to their coding. On some occasions, for instance, there are elements which represent the same object or concept. Examples include an author's name or the title of a journal, which may appear written or coded in a wide variety of ways (e.g., Cyert, R or Cyert, Richard M; *J. Manage. Stud.* or *Journal of Management Studies*), or the different editions of one book. That is why the data had to undergo a careful normalisation process aimed at guaranteeing their accuracy.

With regard to the choice of the documents which would ultimately form part of the analysis, in our specific case, due to the impossibility to work with all the data and since this type of analysis requires the need to establish a cutoff point for the selection of those papers which could be seen as the most influential ones or those having the strongest impact on the scientific community, a decision was made to consider all those documents which had been cited at least 17 times; or, expressed differently, those with citation levels exceeding 6% of the citing sample, thus obtaining a co-citation matrix C with a 98x98 size, which would show the number of times – raw co-citation counts – the previously mentioned documents, taken by pairs, are jointly cited by the total of works included in the sample; in short, the absolute co-citation frequency for each pair of documents.² This co-citation matrix has two main characteristics: firstly, it is a symmetrical matrix; and secondly, all the values in the main diagonal are zero, insofar as one document cannot be cited twice in the same paper.

Once the aforesaid co-citation matrix has been obtained, the following step in this sort of analysis – after deciding or establishing the treatment that is going to be given to the main diagonal values in the matrix so that they can reflect the maximum possible similarity of each ‘paper’ considered with itself –³ consists of obtaining a proximity matrix on which to apply (using the statistical packages SPSS© or STATA©, for instance) diverse multivariate analysis techniques oriented to reduce the dimensionality of the data examined, Pearson’s r coefficient being – despite all the criticism that it has received (Ahlgren et al., 2003, 2004; Van Eck and Waltman, 2008) – one of the most often used measures similarities between pairs amongst a wide variety of normalisation strategies proposed in the area of bibliometrics (by way of example, see Van Eck and Waltman, 2009).

In the research work developed here, owing to our interest in implementing hierarchical cluster analysis as the main multivariate analysis technique and because that choice has proved to be particularly effective when developing such an analysis (e.g., Greene et al., 2008; Schäffer et al., 2011), a decision was made not to use Pearson’s r coefficient, using a co-citation value or relative frequency known as CoCit-Score or index and proposed by Gmür (2003) instead as a similarity measure in order to achieve a ‘similarity between pairs’ matrix S so that the similarity between each pair of documents (P_i, P_j) would be given by their absolute co-citation frequency normalised with respect to the minimum and the average number of citations received by each one of them separately considered:

$$S_{ij} = \frac{C_{ij}^2}{\min(C_{ii}, C_{jj}) \times \text{mean}(C_{ii}, C_{jj})}$$

More specifically, each S_{ij} entry would now be placed on the [0, 1] range, with a high value being indicative of a strong association between ‘papers.’

It additionally deserves to be highlighted that the C_{ii} entry located on the main diagonal would be made to tally in this case with the total number of citations received by paper P_i .

In the previously calculated similarity matrix S – now suitable indeed for the application of multivariate analysis – two barely cited authors or research works (both cited 40 times) with an absolute co-citation frequency of 20, compared to another two often cited authors (100 times, for example) with the same co-citation value would

receive a higher CoCit-Score (0.25 vs. 0.04), from which it could be concluded that the said authors and/or documents are therefore more closely related to each other.

The next section shows the results of the citation analyses and ACAs – obtained, in this last case, from the application of a hierarchical cluster analysis of an agglomerative or upward nature on matrix *S*, for which purpose Ward’s method was used as the agglomeration method – following the advice of authors such as Griffiths et al. (1984), McCain (1990) or Zitt and Bassecoulard (1996) to quote but a few. The section also provides a representation or visualisation corresponding to the intellectual structure of the research on the organisational ambidexterity analysed, made possible through the utilisation of the VOSviewer® tool.

The hierarchical methods mentioned above make it possible to build a classification tree – which is given the name of ‘dendrogram’ – where one can graphically analyse the combination procedure followed, showing which groups gradually combine with one another and on which specific level they do so, as well as the value of the measure for the association between groups when the latter are grouped together.

3 Results and discussion

The results obtained after completing the different stages that the developed analysis consists of are shown below.

Table 1 provides us with a list of the documents most often cited by the research papers about organisational ambidexterity published during the period under examination – which comes as the result of the citation analysis performed.

Table 1 List of the documents most often cited by the research papers about organisational ambidexterity

<i>Ranking</i>	<i>Most-cited documents</i>	<i>Number of citations</i>
1	March (1991)	187
2	Gibson and Birkinshaw (2004)	170
3	Tushman and O’Reilly (1996)	139
4	He and Wong (2004)	137
5	Levinthal and March (1993)	112
6	Benner and Tushman (2003)	111
7	Raisch and Birkinshaw (2008)	109
8	Gupta et al. (2006)	99
9	Lubatkin et al. (2006)	86
10	O’Reilly and Tushman (2004)	75
11	Eisenhardt and Martin (2000)	75
12	Smith and Tushman (2005)	69
13	Raisch et al. (2009)	67
14	Jansen et al. (2006)	65
15	Teece et al. (1997)	63
16	Duncan (1976)	62
17	Adler et al. (1999)	60

Table 1 List of the documents most often cited by the research papers about organisational ambidexterity (continued)

<i>Ranking</i>	<i>Most-cited documents</i>	<i>Number of citations</i>
18	Katila and Ahuja (2002)	58
19	Cohen and Levinthal (1990)	55
20	O'Reilly and Tushman (2008)	55
21	Leonard-Barton (1992)	54
22	Cao et al. (2009)	51
23	Birkinshaw and Gibson (2004)	47
24	Brown and Eisenhardt (1997)	45
25	Barney (1991)	44
26	Lavie and Rosenkopf (2006)	43
27	Christensen (1997)	43
28	Podsakoff et al. (2003)	42
29	Jansen et al. (2009)	41
30	Andriopoulos and Lewis (2009)	41
31	Burns and Stalker (1961)	40
32	Yin (1984)	40
33	Simsek (2009)	36
34	Lawrence and Lorch (1967)	35
35	Fornell and Larcker (1981)	35
36	Aiken and West (1991)	35
37	Eisenhardt (1989)	34
38	Rothaermel and Deeds (2004)	34
39	Kogut and Zander (1992)	33
40	Floyd and Lane (2000)	33
41	Teece (2007)	32
42	Hair et al. (1998)	31
43	Siggelkow and Levinthal (2003)	31
44	Zahra and George (2002)	31
45	Lewis (2000)	30
46	Cyert and March (1963)	30
47	Benner and Tushman (2002)	29
48	Nelson and Winter (1982)	29
49	Grant (1996)	28
50	Henderson and Clark (1990)	28
51	Rosenkopf and Nerkar (2001)	28
52	Atuahene-Gima (2005)	28
53	Ghoshal and Bartlett (1994)	28
54	Gilbert (2005)	25
55	Tushman and O'Reilly (1997)	25
56	Holmqvist (2004)	25
57	Zollo and Winter (2002)	24

Table 1 List of the documents most often cited by the research papers about organisational ambidexterity (continued)

<i>Ranking</i>	<i>Most-cited documents</i>	<i>Number of citations</i>
58	Rothaermel and Alexandre (2009)	24
59	McGrath (2001)	24
60	Anderson and Gerbing (1988)	24
61	Thompson (1967)	24
62	Burgelman (1991)	23
63	Nahapiet and Ghoshal (1998)	23
64	Baron and Kenny (1986)	23
65	Porter (1980)	23
66	Jansen et al. (2008)	23
67	Danneels (2002)	23
68	Mom et al. (2009)	23
69	Armstrong and Evertong (1977)	23
70	Lin et al. (1997)	22
71	Powell et al. (1996)	22
72	Podsakoff and Organ (1986)	22
73	Ghemawat and Ricart (1993)	22
74	Tushman and Anderson (1986)	21
75	Auh and Menguc (2005)	21
76	Simsek et al. (2009)	21
77	Ahuja and Lampert (2001)	20
78	Burgelman (2002)	20
79	Damanpour (1991)	20
80	Jaworski and Kohli (1993)	20
81	Winter (2003)	20
82	Jansen et al. (2005)	20
83	Levitt and March (1988)	20
84	Nonaka and Takeuchi (1995)	20
85	Miles and Huberman (1994)	20
86	Argyris and Schön (1978)	20
87	Beckman (2006)	19
88	Hannan and Freeman (1984)	19
89	Mom et al. (2007)	19
90	Sheremata (2000)	18
91	Abernathy and Clark (1985)	18
92	Chesbrough (2003)	18
93	March and Simon (1958)	18
94	Kyriakopoulos and Moorman (2004)	18
95	Im and Rai (2008)	17
96	Bagozzi and Youjae (1988)	17
97	Crossan et al. (1999)	17
98	Tripsas and Gavetti (2000)	17

The descriptive study of the aforesaid documents shows or provides the following research outcomes:

The papers written by March (1991) and Gibson and Birkinshaw (2004) lead the ranking of most highly cited works with a total of 187 and 170 citations received, respectively.

The works of Tushman and O'Reilly (1996), He and Wong (2004), Levinthal and March (1993), Benner and Tushman (2003), Raisch and Birkinshaw (2008), Gupta et al. (2006), Lubatkin et al. (2006), Eisenhardt and Martin (2000) and O'Reilly and Tushman (2004), these last two with the same number of citations received, 75, complete the top-ten.

As for the total of documents, the list comprises 81 research papers, 16 books and one chapter in a book. Table 2 shows the periodicals or journals in which the aforementioned papers were published.

Table 2 List of journals where the research papers listed on Table 1 have been published

<i>Title of journal</i>	<i>Frequency</i>	<i>Percentage</i>	<i>Total percentage</i>
<i>Organization Science</i>	15	18.52%	18.52%
<i>Strategic Management Journal</i>	14	17.28%	35.80%
<i>Academy of Management Journal</i>	9	11.11%	46.91%
<i>Academy of Management Review</i>	8	9.88%	56.79%
<i>Administrative Science Quarterly</i>	7	8.64%	65.43%
<i>Journal of Management</i>	4	4.94%	70.37%
<i>Journal of Management Studies</i>	4	4.94%	75.31%
<i>Management Science</i>	3	3.70%	79.01%
Others	14	17.29%	100%
<i>TOTAL</i>	<i>81</i>	<i>100%</i>	

On the whole, what becomes visible is that a considerable proportion of these papers were published in the journal *Organization Science* (18.52%). With regard to the remaining works, another four general management journals, all of them with a high impact factor – *Strategic Management Journal* (17.28%), *The Academy of Management Journal* (11.11%), *The Academy of Management Review* (9.88%), and *Administrative Science Quarterly* (8.64%) – accumulate nearly 50% of all the works published, a percentage which rises to nearly 60% if the papers published in *Journal of Management* and *Journal of Management Studies* are included as well.

Concerning the results obtained with the hierarchical cluster analysis, the application of that multivariate analysis technique on matrix S, resulting from the ACA developed allowed us to identify the existence of up to 8 different groups or clusters.

The first of these clusters, or Cluster 1, includes the works of Yin (1984), Eisenhardt (1989) and Miles and Huberman (1994), all of them referring to the so-called or best known as 'case study research method' and to qualitative data analysis or research methodology, insofar as this is the methodology utilised in some of the most significant research works developed in the field of organisational ambidexterity.

The second cluster identified, or Cluster 2, gathers the papers by Christensen (1997), Tripsas and Gavetti (2000), Henderson and Clark (1990) and Tushman and Anderson (1986). More precisely, one book and three research papers focused on failure and on the

main difficulties which are usually faced by already established firms when they have to adapt to changes operated in their business environment.⁴

As for Cluster 3, this cluster or group stands out amongst all the conglomerates for bringing together the highest number of research works. One can actually distinguish up to three different subgroups at a shorter distance, though.

The first of the aforesaid subgroups would be formed by the following eight documents, all of them research journals: Lewis (2000), Sheremata (2000), Birkinshaw and Gibson (2004), Beckman (2006), Jansen et al. (2008), Mom et al. (2007), Ghoshal and Bartlett (1994) and Baron and Kenny (1986). Considering the ‘individual’ level as their unit of analysis, some of these papers offer a discussion about a firm’s ability to be ambidextrous, for example in terms of the exploration and exploitation activities developed by its executives and the extent to which these activities are influenced by intra-organisational knowledge flows, that is, according to their ambidextrous behaviour (Mom et al., 2007), their collective and creative actions (Sheremata, 2000), or the characteristics and attributes of the management team and the way in which it is shaped (Jansen et al., 2008; Beckman, 2006). The role generally played by contextual factors as a determining or contingent element of managerial action (Ghoshal and Barlett, 1994) or the moderating role of transformational leadership – the leadership which favours ambidexterity to a greater extent is characterised by its transformational style for authors such as Jansen et al. (2008) – are also analysed. It is finally worth highlighting that the paper written by Baron and Kenny (1986), in which its authors insist on the importance of not using the terms *moderator* and *mediator* interchangeably, insofar as they are different both conceptually and strategically, would also belong to this first subgroup.

The second subgroup would comprise the research papers listed below: Nahapiet and Ghoshal (1998), Crossan et al. (1999), Nonaka and Takeuchi (1995), Barney (1991), Grant (1996) and Argyris and Schön (1978); six documents in total – two books and four research papers – associated with organisational learning and the knowledge-based firm theory.

The third subgroup identified, with a total of 16 documents, would turn out to be the most heterogeneous of the three. The *ouevres* by Cyert and March (1963), March and Simon (1958), Porter (1980) and Nelson and Winter (1982) or Hannan and Freeman (1984) about the evolutionary approach or theory of economic change or the perspective of organisations’ ecology would form part of this third subgroup. The works of Powell et al. (1996), Ahuja and Lampert (2001), Chesbrough (2003), Brown and Eisenhardt (1997), Jansen et al. (2005), Tushman and O’Reilly (1997), Burgelman (1991), Danneels (2002), Abernathy and Clark (1985), Damanpour (1991) and Benner and Tushman (2002) would complete this third subgroup.

In relation to Cluster 4, this conglomerate includes a total of 9 research works, all of them papers, where it is possible to distinguish two main subgroups closely linked to one another at a smaller distance.

The first of the subgroups mentioned above would comprise the works of Eisenhardt and Martin (2000), Teece et al. (1997), Zollo and Winter (2002), Winter (2003) and Teece (2007), all of them related to the theory of dynamic capabilities – it should be remembered that ambidexterity is precisely seen as a dynamic capability by authors such as O’Reilly and Tushman (2008, 2013) – a perspective which arose during the last decade with the aim of improving the explanatory capacity of the *Resource-Based View of the Firm* with respect to the achievement of a sustainable competitive advantage by firms operating in highly changing environments.

In turn, the second subgroup would bring together the works of Cohen and Levinthal (1990) and Zahra and George (2002) dedicated to the capabilities which are available to a firm when it comes to recognising the value of new knowledge arrived from external sources, to assimilating it and to applying it for commercial purposes – that is, to the ‘absorption capability’ construct. The work of Leonard-Barton (1992), which has as its aim to examine the nature and strategic relevance of a firm’s core capabilities, which can eventually become rigidities in rapidly-changing contexts, as well as that of Kogut and Zander (1992), where its authors analyse how knowledge is recombined through both internal and external learning, thus giving rise to what these authors call ‘combinative capabilities,’ would belong to this second group too.

As for Cluster 5, it includes the papers by Fornell and Larcker (1981), Bagozzi and Youjae (1988), Podsakoff et al. (2003) and Anderson and Gerbing (1988), along with the book by Hair et al. (1998) in its different editions, all of which deal with quantitative methodologies and research techniques.

The works of Atuahene-Gima (2005), Kyriakopoulos and Moorman (2004), Armstrong and Evertong (1977) and Jaworski and Kohli (1993) – all of them published in marketing journals such as *Journal of Marketing* or *Journal of Marketing Research* – about the extent to which the impact of ambidexterity on organisational performance could be moderated by the firm’s greater or lesser orientation to the market – by way of example, Atuahene-Gima (2005) found that organisations lacking a strong market orientation show a worse performance than those which do have such an orientation – together with the papers by Aiken and West (1991) and Podsakoff and Organ (1986), would shape a second subgroup within this same cluster.

Cluster 6 comprises the works by Raisch et al. (2009), Jansen et al. (2009), Cao et al. (2009), Andriopoulos and Lewis (2009), Mom et al. (2009), Rothaermel and Alexandre (2009), Simsek (2009), Simsek et al. (2009), O’Reilly and Tushman (2008) and Gilbert (2005). The aim sought in all of them is to make progress in the knowledge of organisational ambidexterity, its – structural and/or contextual – background, some of the factors which could positively or negatively moderate the impact of exploratory or exploitative types of learning on firm performance or, even though different empirical studies seem to suggest a positive relationship between ambidexterity and performance, the results obtained by the organisation after developing an ambidextrous behaviour.

The works of Lin et al. (2007), Im and Rai (2008), Lavie and Rosenkopf (2006) and Rothaermel and Deeds (2004) about long-term inter-organisational links and organisational ambidexterity or about how a balance between knowledge exploration and exploitation can be achieved through the creation of strategic alliances shape a second subgroup of papers inside this same cluster.

In turn, Cluster 7 – the same as the already described Cluster 3 – allows us to check the existence of three possible subgroups.

The first subgroup would include the works by Jansen et al. (2006), Auh and Menguc (2005), Katila and Ahuja (2002), Floyd and Lane (2000), Ghemawat and Ricart (1993), Duncan (1976), Adler et al. (1999) and O’Reilly and Tushman (2004); eight documents in total, seven papers and one chapter in a book. Authors such as Duncan (1976) argue that firms need to define dual organisational structures in order to implement their innovation processes and achieve success and survival in the long run. Other works such as those of Auh and Menguc (2005), Adler et al. (1999), Ghemawat and Ricart (1993) or Floyd and Lane (2000) contain a discussion about the ability of organisations which might clearly be considered ambidextrous by O’Reilly and Tushman (2004) to balance or

offset certain tensions and, subsequently, to fulfil aims which appear to be contradictory to each other, namely: 'flexibility' vs. 'efficiency,' 'exploration' vs. 'exploitation,' 'static' vs. 'dynamic' efficiency; or, as highlighted by Floyd and Lane (2000), to renovate themselves through the exploitation of their current competences while simultaneously exploring other new ones.

The second subgroup would gather the works of Siggelkow and Levinthal (2003), Burns and Stalker (1961), Lawrence and Lorsch (1967) and Thompson (1967). Particularly the first of these works, the one written by Siggelkow and Levinthal (2003) would on the whole deal, as it were, with the structuring of organisations and its impact on organisational performance – this being an issue which dates back to the classic papers by Burns and Stalker (1961) on mechanistic and organic structures, Lawrence and Lorsch (1967) and Thompson (1967).

As for the third subgroup analysed, it would be formed by the works of Rosenkopf and Nerkar (2001), McGrath (2001), Burgelman (2002), Levitt and March (1988), and Holmqvist (2004), all of them research papers. Based on the assumption that organisations learn not only from their own experience but also from other organisations' experience (Levitt and March, 1988), these works focus, amongst other issues, on the exploration and exploitation of new knowledge, the knowledge processes which serve as the basis for a firm to develop innovations as well as for its ability to innovate – the access to knowledge and experience situated close to the firm's technological base, for instance, would make it possible to introduce incremental improvements directly linked to the specific requirements of a particular product – or the strategies which firms are likely to develop for the purpose of undertaking knowledge exploration (Holmqvist, 2004; McGrath, 2001; Rosenkopf and Nerkar, 2001). As an example, Rosenkopf and Nerkar (2001) distinguish in their paper four types of exploratory strategies depending both on the extent to which the firm crosses the organisational boundaries and on the degree to which technological limits are expanded: local exploration; radical; through the expansion of internal limits; and through the expansion of external limits. As for the aforementioned knowledge processes, Holmqvist (2004) described them from two basic dimensions: the (intra- or inter-organisational) provenance of knowledge; and the type of knowledge implemented.

Finally, Cluster 8 includes the works of Raisch and Birkinshaw (2008), Lubatkin et al. (2006), Smith and Tushman (2005), March (1991), Gibson and Birkinshaw (2004), He and Wong (2004), Tushman and O'Reilly (1996), Benner and Tushman (2003), Gupta et al. (2006) and Levinthal and March (1993); a total of ten documents which are all research papers – nine of them being among the ten research works most often cited in the 283 papers examined here. Among these works are, to quote but a few, the seminal paper by March (1991) and the work of Tushman and O'Reilly (1996), where its authors insist on the idea that organisations need to be ambidextrous in order to ensure their long-term survival, or that of Levinthal and March (1993) about the myopia of learning. With regard to the remaining works, papers like those written by Gibson and Birkinshaw (2004), He and Wong (2004), Lubatkin et al. (2006) or Benner and Tushman (2003), for instance, offer empirical evidence on the positive impact exerted by ambidexterity on the organisation's performance or on how the activities oriented to knowledge exploitation have a positive influence on the results achieved by the firm before stable or easily predictable environments, whereas the ability to develop new technological and market-related capabilities would become essential in ever-changing environments.

There are clear main implications of the analysis developed on the emergence of a generally accepted theory on the capability analysed.

As indicated in the conclusions of this paper, they include the need to integrate the different analysis frameworks, from knowledge management or the *Knowledge-based Theory of the Firm* to the *perspective of dynamic capabilities* and including other theoretical approaches for an adequate understanding of the phenomenon analysed. In the opinion of the authors of this paper, the capability of an organisation to be ambidextrous is best explained through the holistic integration of the principal theoretical approaches.

On another side, the combination of an internal perspective on the different ways of achieving ambidexterity with an external approach in which the ecosystem of the firm rather than the firm itself is considered as the main unit of analysis is also necessary. There is also a possible gap that emerges in the study: the need to analyse the micro-foundations of this organisational capability.

It is also important to study the main antecedents and the conditions necessary to achieve ambidexterity and its impact on performance.

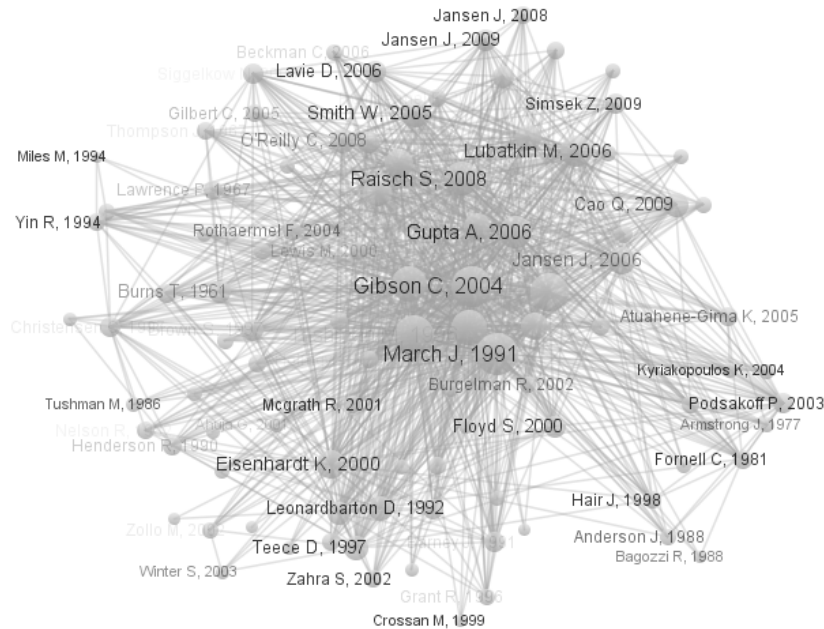
To conclude, a visualisation or graphic representation of the ‘intellectual structure’ or ‘knowledge base’ of the research analysed as a result of using VOSviewer® is provided below.

VOSviewer® is a computer application specifically designed to build and visualise large scientific knowledge maps or domains – the construction of maps from bibliographic information is also known as ‘scientography,’ a term which is hardly used in the literature, though, possibly due to the proliferation of others such as ‘domain visualisation’ or ‘knowledge domains’ related to the same idea – paying special attention to their graphic representation. This tool was developed by the *Centre for Science and Technology Studies* at Leiden University (the Netherlands) and can be used free of charge.

It is also worth highlighting, however, that, although VOSviewer® can be used to build and visualise scientific maps from any kind of co-occurrence data, the application does not permit to create any kind of bibliometric network whatsoever. Neither does this tool have preprocessing capacities, which makes it necessary to use some external software – Bibexcel® and Pajeck® in our case – to prepare the data for their subsequent analysis and representation.

In terms of positioning elements on the map, the analysed application utilises the VOS positioning technique (Van Eck and Waltman, 2010), which builds a similarity matrix on the basis of a co-occurrence matrix – the user must previously create that matrix and load it into the tool – using the so-called ‘association strength’ as a similarity measure to normalise the network (Coulter et al., 1998; Van Eck et al., 2010), also referred to as ‘proximity index’ (Peter and Van Raan, 1993; Rip and Courtial, 1984) or ‘probabilistic affinity index’ (Zitt et al., 2000). The VOS technique (see Figure 1) builds a two-dimensional map where the elements are positioned in such a way that the distances between any pair of elements reflect their degree of similarity in the most accurate possible way. Each element is represented by a tag and a circle on the map. The more important an element is, the larger size its tag will have and the greater volume its associated circle will occupy.

Figure 1 Intellectual structure or knowledge base of the research developed in relation to the construct ‘organisational ambidexterity’: visualisation performed using VOSviewer© –map created using VOS mapping and clustering techniques



4 Conclusions and limitations

Thanks to the use of citation analyses and ACAs together with SNA, the research developed here allows us analyse and represent the intellectual structure or base of research on organisational ambidexterity.

More precisely, and as explained in the abstract of the present paper, a total of 283 research papers which appeared in the journal *California Management Review* after the publication in the summer of 1996 of the seminal work by Tushman and O'Reilly III entitled ‘Ambidextrous organizations: managing evolutionary and revolutionary change’, where these authors suggested that organisations need to explore and exploit simultaneously if they want to be ambidextrous, were used for this purpose – i.e., analysing and representing the intellectual structure or base of research on organisational ambidexterity –, which allowed us to draw a number of important conclusions in this regard, such as the markedly multidisciplinary nature shown by the research undertaken in connection with this construct. From such point of view, our findings in this research work do nothing but corroborate those of other previous more qualitative studies and reviews of the literature such as the one carried out by Raisch and Birkinshaw (2008), according to which ambidexterity is ultimately rooted in a variety of research ‘streams’: from technological innovation to organisation design, going through such theoretical fields or perspectives as: strategic management; inter-organisational networks, strategic alliances or cooperation agreements between forms; or knowledge management inside the firm.

In the literature dedicated to firm strategic management, to quote but one example, analysis perspectives such as the *Resource-Based View of the Firm* (RBV), mainly knowledge, or the dynamic capabilities approach, have been used in the study of organisational ambidexterity. For instance, O'Reilly and Tushman (2008, 2013) conceive ambidexterity as a dynamic capability which enables the firm to orient itself toward exploration and exploitation depending on the business environment conditions.

On another level, it additionally deserves to be stressed that the research work presented here – along with that of Nosella et al. (2012) – is one of the few scientometric studies performed to date about the scientific production developed around this research object, the analysis method used in our case being the joint citations analysis⁵.

This type of analysis, known as joint citations or co-citation analysis and introduced by Small (1973), starts from the premise that a certain thematic similarity, as well an intellectual connection within the field analysed, exists – at least from the citing author's point of view [McCain, (1990), p.443] – between two or more documents which are co-cited (that is, which are jointly cited in a third work published subsequently); and that the higher the co-citation frequency, the more affinity will exist between them (Cawkell, 1976; Garfield et al., 1978; Marshakova, 1973; Small, 1973), thus allowing to see them as belonging to the same 'research front' (Culnan, 1986; de Solla Price, 1965). The intensity of this relationship will be determined by the number of citing or source documents which contain the same pair of documents amongst their references. If it is assumed that the highly cited documents represent the key concepts, methods or experiments developed in a scientific field, such co-citation patterns could then be used to identify and visualise the relationships between those key ideas (Small, 1973). In 1981, White and Griffith proposed ACA as a new technique that could improve the knowledge about the intellectual structure of scientific disciplines, understanding as 'author' the set of works written by the same person. In this context, co-citation occurs when an author cites the pair of documents of any other two given authors amongst his bibliographic references.

Therefore, based on the previous set of assumptions, it could actually be stated, also by way of conclusion, that the 'author' who undoubtedly seems to have more decisively influenced the development of this study object is J.G. March who, in his reflection on organisations and their dynamics, draws a distinction between exploration and exploitation and claims that an essential requirement for organisations' intelligent adaptation, and for their long-term survival, is to maintain an adequate balance between the exploitation of what is already known and the exploration of what can eventually get to be known, even if this implies important contradictions and tensions which the organisation will be forced to cope with. The works of Gibson and Birkinshaw (2004), Tushman and O'Reilly (1996) or He and Wong (2004) and, consequently, their authors too, stand out – together with that of March (1991) – as being some of the most cited and co-cited by the scientific literature examined.

With regard to its possible limitations, the present study shares with other works of the same nature a number of significant limitations which stem directly from the utilisation of the bibliometric techniques implemented in citation analyses and ACAs. Such limitations are mainly due to the fact that the said analyses are independent from the context in which they are developed. It is generally difficult to predict what proportion of the citation has to do with the intrinsic quality of the work cited and what proportion corresponds to other factors such as the prestige of the journal analysed or of the institution to which the author belongs, the possibility of referring to other works

previously published by the citing author, spurious reasons, or even the implementation of a deliberate strategy which permits to ensure the publication of a particular paper in a specific journal, which would imply including other papers published in the same journal amongst the references cited. In any case, and regardless of the reasons why authors cite, the theoretical foundation from philosophy and sociology of science remains the same: the joint citation is made by the citing author whose work contributes to the cumulative progress of science, by repeating old links and trying to find new relationships in previous contributions. Another relevant limitation has to do with the fact that a research work needs time to become influential within a specific research area. To this must also be added – in relation to an analysis like ours – that the existence of a certain degree of subjectivity can hardly be denied or rejected when one has to make a decision about the number of authors that will be finally included in the analysis.

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Notes

- 1 The criteria used to obtain the number of articles to be analysed were as follows: we used the key words of 'organizational ambidexterity' OR 'ambidextrous organizations' in searches of TOPIC in the research areas of 'management' and 'business' in articles published between 1996, the year of publication of the study of Tushman and O'Reilly III: 'Ambidextrous Organizations: Managing Evolutionary and Revolutionary Change', and 2013.
- 2 On the whole, what the literature actually suggests is that no methodological guide or way of acting has been established in this respect, which is why the choice usually results from a series of tests so that the possibility exists to obtain a co-citation matrix with a suitable size for its statistical treatment or its graphic representation. This same view is shared by authors such as Schildt et al. (2006, p.401) in connection with the field of Entrepreneurship.

- 3 More precisely, such values can be treated in two ways. The first one (White and Griffith, 1981) consists in taking the sum of the three highest values or absolute frequencies on the corresponding row or column –note that it is a symmetrical matrix– and dividing that sum by two, which provides a value that, according to the aforesaid authors, could illustrate the importance of a given paper in the field under study; the other option (McCain, 1990) simply starts from regarding such values as missing data or values and applying the pairwise deletion criterion when carrying out the calculations to be developed; that is, from ignoring the main diagonal values when calculating the correlation coefficients between each pair of documents, for example.
- 4 Authors such as Tripsas and Gavetti (2000) stress in their paper how difficult it is for the top managers of these companies to adapt their mental schemes or models – essentially based on their own previous experience and on their system of beliefs and cases associated with the reality and the world that surround them – to the new environmental conditions, thus favouring inertia and giving as a result a poor organisational performance insofar as no new capabilities are being developed.
- 5 The main difference between our paper and that of Nosella et al. (2012) is that the aforementioned authors use the technique of *bibliographic coupling* in their analysis and we use *author co-citation analysis* (ACA). The main difference between the two analysis techniques can be found in the work of Vogel and Güttel (2013).