Study of ambidexterity in recent 30 years: a scientometric analysis using CiteSpace

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Abstract. In recent years, there has been rapid progress in the literature on ambidexterity, but a clear and systematic scientometric analysis is rare. Based on CiteSpace, this study conducted a scientometric analysis of 304 academic publications related to ambidexterity from 1990 to 2023. By identifying and visualizing the collaborative networks, co-citation networks, co-occurrence networks and emerging trends, this study aims to provide a valuable insight for the development of the ambidexterity research field.

Keywords: Ambidexterity, CiteSpace, Collaborative Analysis, Co-citation Analysis, Co-occurrence Analysis

1 Introduction

In today's increasingly dynamic and complex competitive environment, successful organizations need to be proficient at both exploration and exploitation activities. This characteristic is known as ambidexterity[1]. With the attention of top journals in the field of management such as the *Academy of Management Journal* and *Organization Science* to ambidexterity research, there has been an obvious growing trend in research literature on ambidexterity. However, there are still some problems in the existing research, such as conceptual ambiguity and inconsistent research levels. The literature on ambidexterity is lack of systematic review and integration.

Previous review works on ambidexterity were either quantitative or qualitative while no attempt has been made to visualize knowledge maps. Knowledge mapping, which is one of the most important means of knowledge management, plays a special role in presenting concepts, knowledge, and links in visual formats. The popular tools for knowledge mapping include HistCite, VOSviewer, NetDraw, Bibexcel, Pajek, and CiteSpace[2]. Despite the popularity of CiteSpace, to our best knowledge, no attempt has been made to use CiteSpace to analyze ambidexterity.

In order to conduct a systematic and objective review of ambidexterity research, this study conducted a visualization analysis of the articles retrieved from Web of Science (WoS) between 1990 and 2023 using CiteSpace. Specifically, the study is guided by three key goals: (1) to reveal the spatiotemporal features of literature development; (2) to identify key literature in the specific field; (3) to explore the main research hotspots and frontiers of ambidexterity research.

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2 Materials and methodology

2.1 Data acquisition

There are four steps in collecting data for CiteSpace analysis. First, this study selected the Web of Science (WoS) as the database, which is considered to be an ideal data source for scientometric investigations[3]. Specifically, the editions of the search scope were limited to the core collection and Science Citation Index Expanded (SCI-EXPANDED). The second step is to use appropriate vocabulary to select literature from journals. This study selected articles that contained the words "ambidexterity", "ambidextrous", or "exploration and exploitation" in their topic or keywords between 1990 and 2023. Next, only articles and reviews were selected after excluding some record types (e.g. editorial material, proceedings papers, meeting abstracts, corrections, letters, data papers, book chapters). Finally, considering the limitations of the field being explored, categories were limited to "management", "Business", "Economics" and "Behavioral sciences". A total of 304 references were obtained.

2.2 Analysis tool

CiteSpace is a visual analytic tool for analyzing trends and patterns in the scholarly literature of a field of research. In the map, different nodes represent elements such as cited references, institutions, authors, and countries, and links between nodes represent collaboration/co-occurrence/co-citation relationships. The purple round represents centrality, while the red round represents burstness. The color of each year-round can be used to judge the distribution of citation time, and the size of each node can be used to judge the frequency of citations.[2][4][5]

This study will be conducted by the following analysis steps: First, the spatial-temporal collaboration relationship will be clarified through a country map, an institution map, and an author map. Secondly, the knowledge structure and key literature in the field will be identified through a co-citation network. Finally, research hotspots in the field will be identified through keyword co-occurrence and frontline research will be detected through burst detection.

3 Knowledge mapping results

3.1 Research outputs

As shown in Figure 1, the number of published papers on ambidexterity by SCI-E reached a peak in 2014 and 2021. Although there have been fluctuations in certain time periods, such as a downward trend in the past three years, the overall stable growth trend is evident. The result suggests that ambidexterity, which was once predicted to become the mainstream research paradigm in the field of management[6], is receiving increased attention and more ambidexterity research is being conducted.

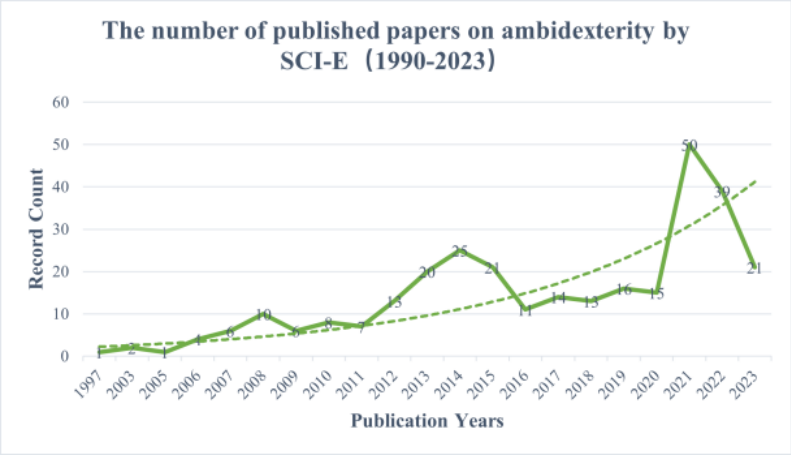

Fig. 1. The number of published papers on ambidexterity by SCI-E(1990-2023).

3.2 Analysis of country

Fig. 2. A visualization of the country collaboration network.

Generating a country map using CiteSpace resulted in 268 nodes and 376 links (Figure 2). In terms of the number of publications, the USA is the largest contributor, publishing 106 papers, followed by China (41). The number of publications from England is 61 and the country ranks third. Then comes Italy (18) and Germany(17). The top five countries in terms of centrality(purple round) were the USA(0.63), England(0.34), China(0.33), Italy(0.20), and Germany (0.15), indicating the high impact of these countries in the ambidexterity research field.

3.3 Analysis of institutions and authors

The institution collaboration network consisted of 646 nodes and 1716 links and is shown in Figure 3. It is apparent that although there are institutions with a high number of publications (e.g. Georgia State University and National University of Singapore), no centrality is observed (0.00), indicating that there are no influential academic institutions in the field of research at present. Although there are some close academic networks among institutions in certain regions, such as Birmingham Business School, University of the West of Scotland, University of Turin, and University of Naples Federico II in the UK, France, and Italy in the field of knowledge management, the relatively low maturity of the research community between the East and West is indicated by the loose structure and few close relationships.

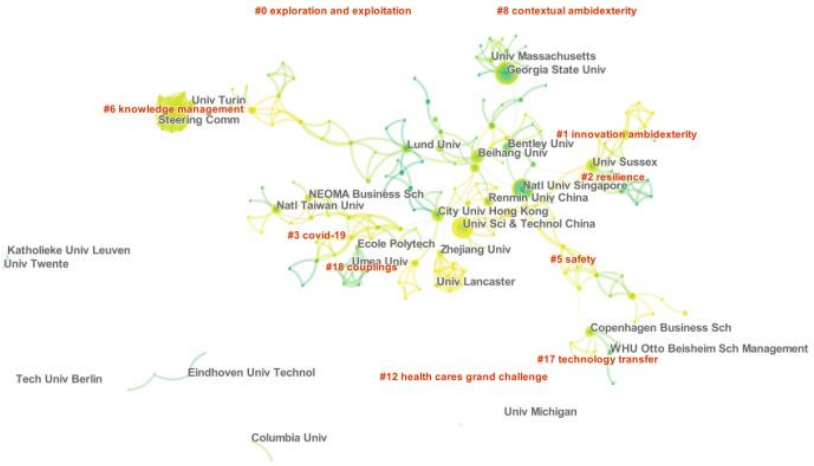

Fig. 3. A visualization of the institution collaboration network.

Fig. 4. A visualization of the author collaboration network.

Generating an author map using CiteSpace resulted in 830 nodes and 1178 links. The decentralization of the author collaboration network is clear, which can be seen in Figure 4. There are no authors with particularly strong centrality, indicating that there are no core scholars who play a bridge role in the scientific research collaboration network at present.

In the long term, more collaborations between institutions and authors are required in order to view research issues from multiple perspectives. The development potential of collaborative networks in the field of ambidexterity is enormous.

3.4 Analysis of co-cited references

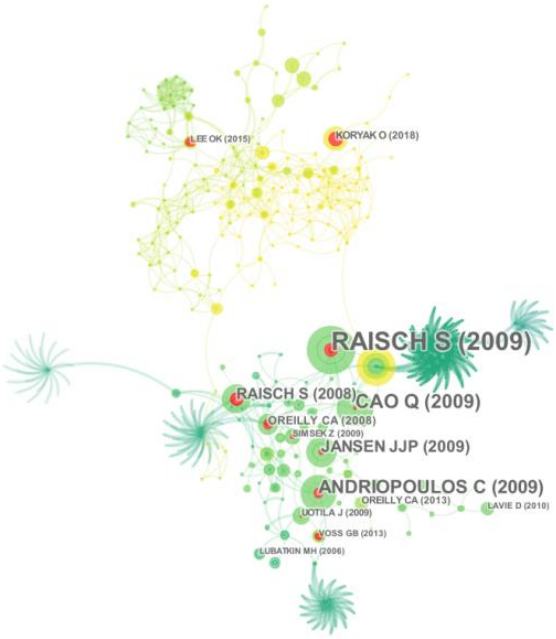

Fig. 5. A visualization of the cited reference co-citation network.

As can be seen in Figure 5, generating a cited reference co-citation map resulted in 721 nodes and 2132 links. The co-citation analysis of documents can help us identify the most influential points in the knowledge structure. The most cited articles are usually regarded as landmarks due to their ground-breaking contributions[7]. Table 1 lists the top five co-cited references. According to the formula given by Professor Chen[8]: *Sigma = (centrality + 1)* * *burstness*, it can be seen that the Sigma value is a composite index made up of both centrality and burstness values, used to identify innovative literature. The fact that the sigma values of all five articles in Table 1 are 1.0 indicates that they are key papers that are important for both structural and citation changes.

Table 1. Top five co-cited references related to ambidexterity research.

Citation counts	Sigma	Cited reference	Representative author (publication year)
23	1.0	Organizational Ambidexterity: Balancing Exploitation and Exploration for Sustained Performance	Raisch S, Birkinshaw J, Probst G, et al(2009)
17	1.0	Organizational Ambidexterity|| Exploitation - Exploration Tensions and Organizational Ambidexterity: Managing Paradoxes of Innovation	Lewis A M W(2009)
17	1.0	Unpacking Organizational Ambidexterity: Dimensions, Contingencies, and Synergistic Effects	Cao Q , Gedajlovic E , Zhang H(2009)
15	1.0	Structural Differentiation and Ambidexterity: The Mediating Role of Integration Mechanisms	Jansen J J P, Tempelaar M P, Bosch F A J V D, et al(2009)
14	1.0	Organizational Ambidexterity: Antecedents, Outcomes, and Moderators	Raisch S, Birkinshaw J(2008)

3.5 Analysis of keyword co-occurrence

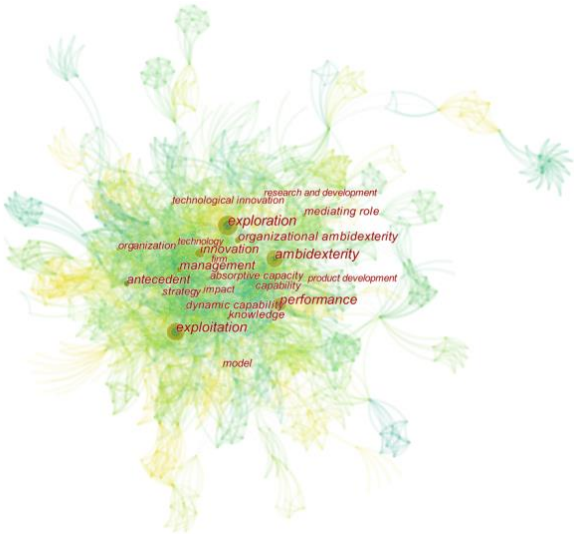

Fig. 6. A visualization of the keyword co-occurrence network.

A knowledge map of keyword co-occurrence could reflect hot topics. Generating a keyword co-occurrence map resulted in 1438 nodes and 6938 links (Figure 6). An analysis

in terms of co-occurrence frequency and centrality revealed that the hot keywords focused on below areas:(1) related to the concept of ambidexterity, such as *exploration* and *exploitation*. As pointed out by scholars[9], one of the core propositions of ambidexterity is how to effectively handle the tension between exploration and exploitation activities. (2) related to the research perspective, such as *paradox* and *dynamic capacity*. With the development of ambidexterity theory in strategic management, organizational learning, and other fields, the structural view[10] gradually expands to the contextual view[1]. The former is considered to apply to the organizational level, while the latter emphasizes that ambidexterity can be achieved within the same business unit. In addition, the paradox perspective views ambidexterity as a way of thinking to solve internal contradictions in an organization[11]. Based on organizational learning theory and dynamic capability theory, the capability perspective suggests that organizations should utilize ambidexterity (which is regarded as a dynamic capability) to improve their performance[9]. (3) related to the research levels, such as *organization, firm, entrepreneurship,* and *managers*. Ambidexterity was first applied to the organizational level[10] , until Mom[12] first introduced it to the individual level in 2009, followed by a series of studies related to individual ambidexterity and ambidextrous leadership[13][14][15]. There are also some other hot keywords (4) related to the mechanism[18][19](such as *antecedent, mediating role, moderating role, performance,* and *impact*) and (5) related to the research methods (such as *case study* and *structural equation model*).

3.6 Analysis of burst keywords

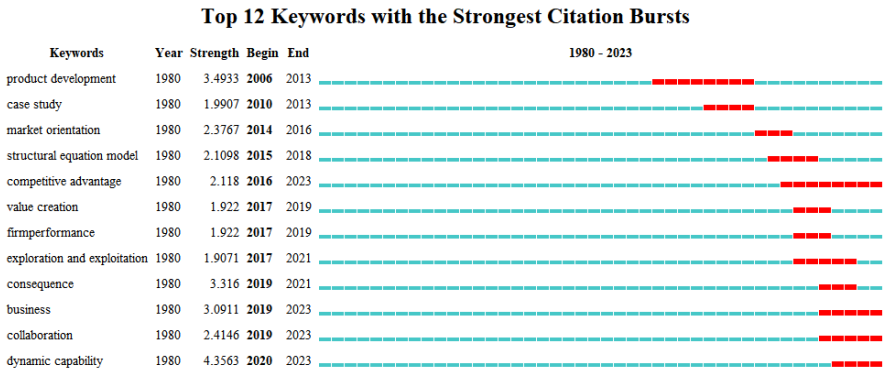

Fig. 7. Top 12 keywords with the strongest citation bursts.

CiteSpace is specifically designed to facilitate the detection of emerging trends and abrupt changes in scientific literature. Burst keywords (keywords that are cited frequently over a period of time) could indicate frontier topics. The top 12 keywords with the strongest citation bursts are shown in Figure 7, which can be identified as new trends in ambidexterity research among different periods. The evolution of popular research

methods can be observed, with the popularity of *case study* from 2010-2013 being replaced by *SEM* from 2015-2018. In addition, in recent years, *dynamic capability* has become a hot research topic in the field of ambidexterity. Scholars have found that the capability perspective holds a dominant position in the empirical research on ambidexterity[16]. The reason may be that by examining the performance of organizations, the capability perspective provides a more clear and convenient measure of ambidexterity.

4 Discussions and Conclusions

This study, based on the CiteSpace analysis, provides a clear and systematic knowledge map for the field of ambidexterity research. A number of conclusions can be drawn from the results.

First, countries led by the United States and China have shown their influence in the field of ambidexterity research. There has also been closer inter-institutional cooperation in some regions such as Western Europe. However, overall collaboration among countries, institutions, and authors still needs to be further developed, especially in academic cooperation between the East and the West.

Secondly, some high-cited literature and high-burst literature in the ambidexterity research field should be given more attention. It is crucial to keep up with the fast-moving body of literature, not only because new discoveries emerge from a diverse range of areas but also because they may fundamentally change the collective knowledge[17].

Thirdly, the current research on ambidexterity mainly focused on areas such as conceptual connotation and impact mechanism. Based on different theoretical sources, research perspectives have gradually shifted from only structural perspective to richer perspectives, such as behavioral view, leadership view, and dynamic capability view. On the basis of the organizational level, research has also expanded to the individual level. What's more, the dynamic capability perspective has dominated ambidexterity empirical research over the past decade and is believed to remain a hot topic in the future.

In conclusion, this study provides a unique insight into ambidexterity and valuable information for relevant researchers to identify new perspectives concerning cooperative countries/institutions/scholars, key literature, hot topics, and research frontiers. We look forward to more diverse paradigms, metrics, and methods being used to explore and explain the development of the ambidexterity field in the future as it was predicted to become the mainstream research paradigm in the field of management[6].

References

1. Gibson C B, Birkinshaw J. The Antecedents, Consequences, and Mediating Role of Organizational Ambidexterity[J]. *Academy of Management Journal*, 2004, 47(2):209-226.
2. Chen C .CiteSpace II: Detecting and visualizing emerging trends and transient patterns in scientific literature[J].*Journal of the American Society for Information Science and Technology*, 2006, 57(3):359-377.

3. Leeuwen T V .The application of bibliometric analyses in the evaluation of social science research. Who benefits from it, and why it is still feasible[J].*Scientometrics*, 2006, 66(1):133-154.
4. Chen C .The centrality of pivotal points in the evolution of scientific networks[J].*International Conference on Intelligent User Interfaces*, 2005(AN):p.98-105.
5. Xie P .Study of international anticancer research trends via co-word and document co-citation visualization analysis[J].*Scientometrics*, 2015, 105(1):611-622.
6. Raisch S, Birkinshaw J, Probst G, et al. Organizational Ambidexterity: Balancing Exploitation and Exploration for Sustained Performance[J]. *Organization Science*,2009, 20(4):685-695.
7. Chen C, Hu Z, Liu S, et al. Emerging trends in regenerative medicine: A scientometric analysis in CiteSpace[J]. *Expert Opinion on Biological Therapy*,2012, 12(5):593–608.
8. Chen C , Ibekwe-Sanjuan F , Hou J .The Structure and Dynamics of Co-Citation Clusters: A Multiple-Perspective Co-Citation Analysis[J].*Journal of the American Society for Information Science & Technology*, 2014, 61(7):1386-1409.
9. O'Reilly C A, Tushman M L. Organizational ambidexterity: Past, present, and future[J]. *Academy of Management Perspectives*,2013, 27(4): 324-338.
10. Duncan R B. The Ambidextrous Organization: Designing Dual Structures for Innovation[J]. *Management of Organization Design*, 1976,1:167-188.
11. Smith W K, Tushman M L. Managing Strategic Contradictions: A Top Management Model for Managing Innovation Streams[J]. *Organization Science*, 2005, 16(5):522-536.
12. Mom T J M, van den Bosch F A J, Volberda H W. Understanding variation in managers' ambidexterity: Investigating direct and interaction effects of formal structural and personal coordination mechanisms[J]. *Organization science*, 2009, 20(4):812-828.
13. Rosing K, Frese M, Bausch A. Explaining the heterogeneity of the leadership-innovation relationship: Ambidextrous leadership[J]. *The Leadership Quarterly*, 2011, 22(5): 956-974.
14. Keller T, Weibler J. What it takes and costs to be an ambidextrous manager[J]. *Journal of Leadership & Organizational Studies*, 2015, 22(1): 54-71.
15. Good D, Michel E J. Individual ambidexterity: Exploring and exploiting in dynamic contexts[J]. *The Journal of Psychology*, 2013, 147(5): 435-453.
16. Ling H, Zhao F C, Deng S Jun. A critical review of the theory and concept of ambidexterity and prospects for future research[J]. *Foreign Economics & Management*, 2010(1):9.
17. Chen C .Predictive effects of structural variation on citation counts[J].*Journal of the American Society for Information Science and Technology*, 2012.
18. Tarba S Y, Jansen J, Mom T, et al. A microfoundational perspective of organizational ambidexterity: Critical review and research directions[J]. *Long Range Planning*,2020, 53(6):102048.
19. Pertusa-Ortega E M , José F Molina-Azorín, Juan José Tarí, et al. The microfoundations of organizational ambidexterity: A systematic review of individual ambidexterity through a multilevel framework[J].*Business Research Quarterly*, 2020,24(4):355-371.