

Research Progress and Trends in Organizational Resilience Research: Knowledge Graph Analysis Based on CiteSpace

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Abstract

Organizational resilience is an important core element for today's companies to turn around in the VUCA¹ environment. It can strengthen the ability of companies to adapt and help them to regain their strength in adversity. In this paper, based on CNKI database and WOS (Web of Science) database search to get the Chinese and foreign literature (special reference to English literature) for the whole year 2000-2022, and use bibliometric method to analyze the hot spots and research trends in the field of organizational resilience research, the results found that: 1) there is more foreign-language research literature on tissue toughness than Chinese-language research literature, and the number of articles published in Chinese journals on this topic has entered a rapid growth phase since 2011, and the number of articles published both at home and abroad is generally on the rise, and tissue toughness is increasingly becoming a research hotspot; 2) from the cooperation of existing published literature, the cooperation network between research scholars is generally more dispersed, and domestic scholars are mostly independent; 3) From the viewpoint of research hotspots, individual resilience, supply chain resilience and risk management are hotspots in foreign organizational resilience research; domestic research mainly focuses on the connotation and measurement dimensions of organizational resilience, individual resilience and dynamic capabilities.

Keywords

Organizational Resilience, Bibliometrics, Knowledge Mapping

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¹VUCA is an acronym for volatility, uncertainty, complexity, and ambiguity.

1. Introduction

The international environment has been changing rapidly in recent years, with unpredictable “black swan” events, such as the 2020 Newcastle pneumonia epidemic, which affected global supply chains and dealt an unprecedented blow to many companies, causing most of them to be unable to maintain basic production activities, while a few of them were able to adapt flexibly and even rise to the top. With the impact of such events, the importance of organizational resilience becomes even more pronounced. Organizational resilience helps to resist the interference of various risks to the organization, and is a necessary capability for organizations to achieve survival and growth in a volatile and changing environment. How to enhance organizational resilience is a common hot topic among scholars at home and abroad in recent years, and several research schools have been formed.

The study of “resilience” began in the fields of physics and psychology, for example, to describe the property of physical materials to avoid breaking or deforming themselves under load [1] and the ability of individuals to be optimistic and counteract negative emotions in the face of negative shocks [2]. With the intense changes in the international environment and business competition trends, the concept of “resilience” was introduced into the field of management and gave rise to the topic of “organizational resilience”, which is considered to be a key factor in ensuring the sustainability of a company [3]. As different disciplines focus on different perspectives, scholars in different fields have different understandings of “organizational resilience”, resulting in a lack of consistency in its connotation. The number of review articles available is small and narrow, focusing more on individual resilience than organizational resilience; only a few articles address the increasingly complex and uncertain external environment that companies face today [4]. In this paper, we focus on organizational resilience of enterprises, and on the basis of extensive search of domestic and international organizational resilience literature, we use CiteSpace to conduct knowledge mapping analysis to sort out its research development process and frontier hotspots, so as to provide theoretical reference for the field of organizational resilience research.

2. Data Sources and Methods

To ensure the reliability and comprehensiveness of the original data, the Chinese literature data were obtained from the CNKI (China Knowledge Network) database and the foreign literature from the WOS (Web of Science) full-text database. The search time range was set as “2000-01-01 to 2022-12-31”. In the CNKI database, we searched for the topic “organizational resilience” by advanced search, and then selected the field of business economics and management research, excluding conferences, dissertations, and unrelated literature. The data were exported to plain text files in “RefWorks” format and transcoded to form the sample data. The data were also searched in WOS by advanced search with the sub-

ject terms “organizational resilience”, “the capacity for resilience”, and “organizing for resilience”, “organizing for resilience”, “resilience capabilities and organizational effectiveness”, and “team resilience”, then select the research field “business economics” and filter the “Articles” and “Reviews”. “The total number of articles obtained was 2945. The original sample data were exported and transcoded in the format of “full record and cited references” (including title, author, institution, abstract, keywords and year of publication).

3. Study Results and Data Analysis

3.1. Analysis of the Volume of Articles Issued

The chronological change in the number of literature in the field of tissue toughness research was plotted based on the data exported from CNKI and WOS databases (see **Figure 1**). The Chinese literature was vacant before 2011, with no relevant literature published; it showed a slow and sporadic growth trend during 2011-2019, with the number of articles fluctuating between 0 and 5 per year. Individual scholars began to explore the concept of “individual resilience” in 2011, representing the beginning of the development of this field. For example, it is proposed that the mental toughness of employees is important for employees to cope with today’s fast-paced, high-stress, and rapidly changing work environment [5]; strengthening research on the mental toughness of employees in organizations and improving the mental toughness of employees are of great theoretical and practical significance for improving the quality of work and life of employees and the productivity of enterprises [6]. 2020-2022 is the period of a period of rapid rise in the number of publications, with the overall number of publications climbing to 134 over three years, the peak of research publications in this field. The authors speculate that the outbreak of the new crown epidemic in this period has hindered the development of many domestic enterprises and attracted high academic attention, indicating that social events have a strong role in promoting organizational resilience research hotspots; and some research literature on individual enterprises with high resilience (e.g., Huawei, Senma) was born in a short period of time, indicating that high resilience can make enterprises stand out in special times and attract high academic attention, and the importance of high resilience is self-evident.

The field of tissue resilience research in the WOS database has a low number of publications between 2000 and 2008, with the overall number fluctuating between 1 and 9 articles, and there is no core journal literature. The research in this time period is in its infancy, and no comprehensive and authoritative research has emerged. Similar to the initial state of the Chinese research field of organizational resilience, it was also explored from the perspective of individual employee resilience. Scholars have proposed that personal resilience (a combination of self-esteem, optimism, and perceived control) is associated with higher levels of change acceptance, with lower levels of change acceptance, lower job satisfaction, greater job irritation, and greater willingness to quit [7]; resilience, the

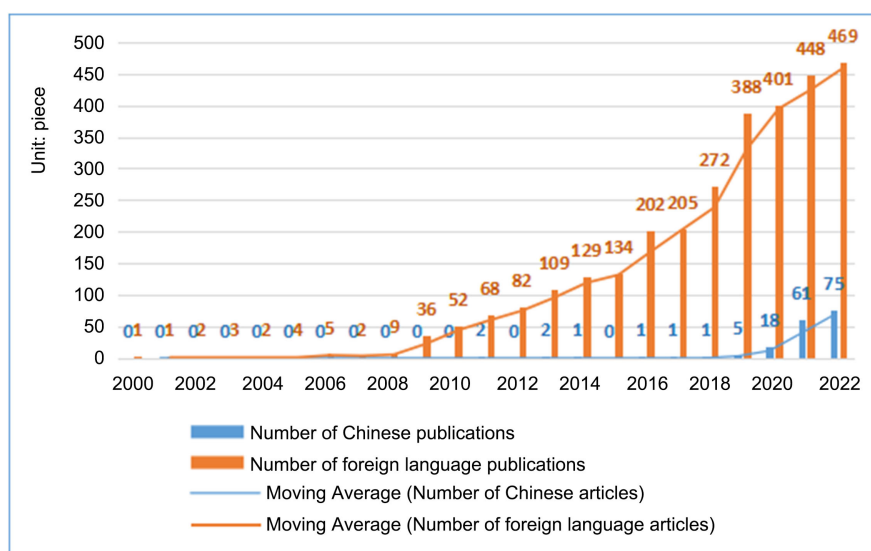


Figure 1. Annual change in the number of literature in the field of tissue resilience research.

ability to buffer change, learn, and evolve, the ability to maintain and enhance adaptive capacity in a complex world of rapid transformation [8]. The number of articles increased year by year from 2009 to 2022, and the growth trend is more stable, indicating that the academic community's attention to the field has increased year by year since 2009; the number of articles grew faster from 2018 to 2022 and reached the peak of the number in 2022, indicating that the growth rate of the research heat in the field of organizational resilience became higher during this period, probably because of the international rapid changes in the environment (e.g., trade policies, unexpected events, and local wars) are causing more pronounced impacts on firms and drawing wider attention from the academic community.

The number of foreign language literature issued in all phases from 2000 to 2022 is always more than that of Chinese literature, ranging from 6 to 272 times the number of Chinese literature issued, and the overall research heat between Chinese and foreign language literature shows a continuous upward trend.

3.2. Keyword Analysis

We use CiteSpace to draw keyword co-occurrence and clustering knowledge map and conduct statistical frequency (Count), centrality (Centrality) and emergent keyword emergent intensity (Bursts Strength) analysis of keywords to comprehensively grasp the hot spots in the field of organizational resilience research.

3.2.1. Keyword Co-Occurrence Analysis

The frequency of keyword occurrences reflects the hotness of the research area, while keyword centrality indicates the amount of information flow between keywords it controls and the degree of control over the entire web resource. Based on the exported data from CNKI and WOS databases, keyword co-occurrence

knowledge mapping was performed using CiteSpace, as shown in **Figure 2**.

The metrics modularity (Q) and average silhouette (S) can measure the effect of clustering mapping, Q in the interval of [0, 1), $Q > 0.3$ indicates that the generated clustering mapping network structure is significant, the larger the Q value, the better the clustering effect; S reflects the homogeneity of the clustering mapping network, $S > 0.5$ indicates that the generated clustering mapping is reasonable, $S > 0.7$ indicates that the clustering mapping is highly credible [9]. In the CNKI Chinese literature keyword clustering map, the modularity value is $0.7446 > 0.3$, and the average profile value is $0.9908 > 0.5$, indicating that the academic network has a significant clustering structure, and the independence among modules is very high and convincing. The modularity value is $0.3554 > 0.3$ and the average profile value silhouette is $0.7055 > 0.5$, which indicates that the academic network has a reasonable clustering structure and the modules in the network have some connection with each other and also have high independence, which is convincing. A total of five keyword clusters were derived from this analysis, namely “supply chain resilience”, “psychological capacity”, “climate change”, and “climate change”, “climate change”, “governance”, “disaster”, and “optimization”, and “optimization”. The above five labels show the focus of scholars’ research on organizational resilience at this stage.

The top 10 keywords were selected and ranked by frequency size, as shown in **Table 1**. In order to avoid redundant statistics and to highlight the hot topics related to the research purpose, the keyword “organizational resilience”, which was included in the search topic, was excluded from the statistics. From the table, we can see that the Chinese literature “influence factor”, “dynamic ability”, “job performance” and foreign literature “impact”, “adaptive capacity”, and “performance” have strong keyword correlation. The frequency of “enterprise resilience” (9) is the highest, and the centrality of “small and medium-sized enterprises” (0.3) is the highest in the Chinese literature. “Enterprise” is the core object of organizational resilience research, and most of the literature mentions enterprise management and innovation. It has been argued that the fierce market competition in the emerging economy poses challenges to Chinese enterprises, especially SMEs, and that the lack of forward planning, limited resources, management innovation, and business experience undermine the ability of enterprises to adapt, and that high resilience capabilities must be developed to overcome these weaknesses [10]; technological innovation helps enterprises to develop core competencies while maintaining their independence and autonomy. Enhancing the self-adjustment of firms in the face of crisis is therefore considered as the core of continuous innovation and fundamental to building firm resilience and maintaining long-term competitive advantage [11].

The keyword with the highest frequency (562) in the foreign literature is “management” and the keyword with the highest centrality (0.06) is “system”. The term “social ecological system”, which has been the longest-running keyword among the emergent keywords, has received continuous attention from

Table 1. Frequency and centrality ranking analysis of the top 10 keywords.

Serial number	CNKI			WOS		
	Frequency	Centrality	Keywords	Frequency	Centrality	Keywords
1	9	0.21	Corporate Resilience	562	0	management
2	7	0.07	New crown outbreak	515	0.03	climate change
3	5	0.01	Mental Toughness	418	0	impact
4	5	0.3	Small and medium-sized enterprises	333	0	adaptive capacity
5	4	0.04	Influencing Factors	329	0.02	adaptation
6	4	0.07	Crisis Situations	328	0.02	framework
7	4	0.25	Corporate Performance	326	0.04	performance
8	4	0.07	Dynamic Capabilities	310	0.03	vulnerability
9	4	0	Team Resilience	279	0.06	system
10	3	0	Job Performance	239	0	capacity

**Figure 2.** Keyword co-occurrence mapping of tissue toughness literature.

academics during the 9-year period (2009-2017). Related research has proposed that adaptation refers to the ability of social actors or social-ecological systems to respond to or anticipate environmental change, and has argued that social learning processes are important for building adaptive capacity in multiple ways and at different scales [12]; social and ecological systems research provides new perspectives, practices, and new spaces of opportunity to address the challenges of the Anthropocene, and that social and social-ecological systems. Different values and beliefs about deep, dynamic connections between them can support

the ability to cope with shocks and surprises. And with a high number of citations in the relevant literature, the relationship between social-ecological systems and organizational resilience has received widespread attention in the academic community.

3.2.2. Keyword Emergence Analysis

In co-occurring keyword analysis, the burst intensity reflects the research hotness of keywords in the network for a period of time, thus reflecting the research trends and hot spots. Using the burst detection function of CiteSpace, we obtained the burst words in Chinese and foreign literature (because there were only 6 burst words in Chinese literature, the top 6 burst words in foreign literature were taken for comparison), as shown in **Table 2**.

The keywords of Chinese literature with greater intensity and longer duration include “psychological resilience”, “job performance” and “organizational identity”, which are concentrated in the period of 2011-2017. They represent a more static research perspective and focus on the internal components of organizational resilience. “Psychological resilience” is a representative keyword in the early stage of the study, and the domestic research on organizational resilience began to develop gradually from the discussion of the psychological resilience of employees, so it lasted the earliest and longest time. The other three emergent keywords are “dynamic capability”, “role process” and “uncertainty” in 2020-2021, which emphasize that organizational resilience is “dynamic” and “process” and that changes in the external environment are “uncertain”; the changes in the emergent keywords generally reflect the change in research perspective, *i.e.*, from a static to a dynamic perspective. The change of the emergent keywords generally reflects the change of the research perspective, *i.e.*, from a static perspective to a dynamic perspective; this time period is also the stage of the rapid rise of domestic organizational resilience research, and the drastic changes in the external environment affect the research perspective and research progress.

Table 2. Keywords emergence ranking.

Serial number	CNKI			WOS		
	Keywords	Strength	Time	Keywords	Strength	Time
1	Mental Toughness	2.5	2011-2017	Innovation	13.53	2021-2022
2	Job Performance	1.35	2011-2020	Social ecological system	9.91	2009-2017
3	Organizational Identity	1.3	2013-2017	Capability	9.86	2020-2022
4	Dynamic Capabilities	0.97	2020-2021	Biodiversity	9.3	2010-2016
5	Process of action	0.48	2020-2021	Dynamic capability	9.17	2021-2022
6	Uncertainty	0.48	2020-2021	Adaptive management	8.92	2010-2015

The keyword “innovation” has the highest emergence intensity in the foreign literature, and it appears in the period of 2021-2022. The external social environment has changed a lot during this period, and the attention of the academic community to corporate innovation reflects the importance and necessity of innovation for corporate organizational resilience. Finally, the term “dynamic capability” is consistent with the emergent keyword “dynamic capability” in Chinese literature, which is influenced by the changes in the social environment in this period, and domestic and foreign studies are all based on a dynamic perspective, and consider organizational. The dynamic capability of action and control can help organizations react quickly to crises and adjust their strategies flexibly.

3.3. Analysis of Author-Institution Cooperation Networks

3.3.1. Analysis of the Cooperation Network of Posting Authors

The collaborative relationship network is mapped with authors as node types, as in **Figure 3**. The development of the research field has benefited from the contributions of many authors, and the research of authors with a large number of publications is somewhat representative. The figure shows that scholars in the field of organizational resilience research in Chinese and foreign languages have taken shape, and most Chinese scholars are independent in their research and cooperate less with each other, while foreign language scholars have established more extensive collaborative relationships and cooperate relatively closely with each other. The author believes that Chinese scholars’ research on organizational resilience started late and has not formed a relatively unified academic consensus, such as the definition of the concept of organizational capriciousness and measurement dimensions; the academic views and research perspectives of scholars differ greatly, leading to a lack of close cooperation between them, and each of them is independent and scattered. In contrast, foreign scholars started early on the research related to organizational resilience, and the trend of research enthusiasm has grown steadily; the overall number of scholars is more than that of China, the school was formed earlier, the research perspective is more fixed, and the cooperation between them is more frequent and close, and has made great development in the past 20 years.

The statistics are sorted by the volume of publications by the authors of the literature, as shown in **Table 3**. The volume of publications by the top 10 authors can be seen that the scholars who have contributed more in the field of Chinese research include Wang Yong and Zhang Jichang. Wang Yong started his research on the measurement dimensions and reliability of organizational resilience and the influencing factors, and developed the organizational resilience scale, which provides a universal measurement tool for the study of resilience capability of domestic medium and large enterprises; Zhang Jichang focused on the study of the drivers of organizational resilience of enterprises under the influence of the new crown epidemic starting in 2020, and believed that non-sedimentary

redundant resources, managerial capability and innovation capability play a more important role in the formation of organizational resilience of private enterprises. The study argues that non-sedimentary redundant resources, managerial capabilities and innovation capabilities play a more important role in the formation of organizational resilience in private enterprises. Foreign literature contributors such as Ivanov, Dmitry and Ford, James D have contributed to this area of research with the largest number of articles, reaching eight.



Figure 3. Co-presentation map of the collaborative network of posting authors.

Table 3. Number of articles issued by the author of the article.

Serial number	CNKI		WOS	
	Quantity	Author	Quantity	Author
1	3	Wang Yong	8	Ivanov, Dmitry
2	2	Zhang Jichang	8	Ford, James D
3	2	Zhang Chang	6	Hosseini, Seyedmohsen
4	2	Jiang Hui	6	d’errico, Marco
5	2	Zhao Na	6	Prayag, Girish
6	2	Zhang Gong Yi	6	Hickey, Gordon M
7	2	Zhang Huaiying	5	Avey, James B
8	2	Zhu Yanhan	5	Cinner, Joshua E
9	2	Liu Bin	4	Griffiths, Andrew
10	2	Chen Ruijun	4	Aleksic, Aleksandar

3.3.2. Analysis of Cooperation of Issuing Institutions

As shown in **Figure 4**, the cooperation networks of Chinese literature publishers in the field of organizational resilience research are fragmented, and the number of cooperation is relatively small, and they are all small-scale cooperation between institutions. Foreign language literature publishers form obvious central cooperation networks, and there are more small-scale cooperation networks.

As seen from the statistical table of institutional issuance (**Table 4**), the largest number of articles (5) was issued by Nanjing University School of Business among the institutions issuing Chinese literature, while it had few issuance contacts with other institutions, with only one cooperation with the School of Business and Economics of Huaqiao University and the Institute of Financial Strategy of the Chinese Academy of Social Sciences. The institutions with the highest number of mutual cooperation are Sichuan University School of Business, Nankai University School of Business, Northeast University of Finance and Economics School of Business Administration, and Nanjing Normal University School of Business. The number of articles issued by foreign language literature institutions is most often the University of Queensland (35 articles) and Arizona State University (32 articles), who have relatively close cooperation with the Chinese Academy of Sciences and the University of Leeds with other issuing institutions, constituting a more complex network of cooperation in issuing articles.

Table 4. Issuance of documents by issuing institutions.

Serial number	CNKI		WOS	
	Quantity	Institution	Quantity	Institution
1	5	Nanjing University School of Business	35	Univ Queensland
2	4	College of Business Administration, Northeastern University of Finance and Economics	32	Arizona State Univ
3	4	Northeast University of Finance and Economics	27	Univ Leeds
4	3	Huaiyin College of Technology Business School	26	Chinese Acad Sci
5	3	Nankai University School of Business	24	McGill Univ
6	3	Inner Mongolia University of Finance and Economics	23	Stockholm Univ
7	3	School of Management, Jilin University	23	Monash Univ
8	3	Jishou University School of Business	22	Univ Auckland
9	3	Nanjing Normal University Business School	21	Wageningen Univ & Res
10	2	School of Economics and Management, Beijing Jiao Tong University	21	Univ Oxford

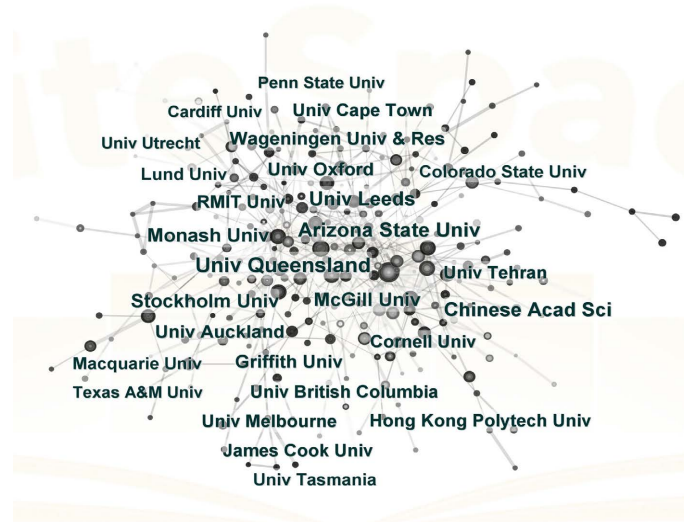


Figure 4. Mapping of collaborative networks of issuing institutions.

3.4. Evolution of Research Hotspots

In order to visualize the evolution of the hotspots of tissue resilience research at home and abroad, the keyword co-occurrence time zones at home and abroad were plotted (Figure 5); and combined with the background of the times, the research in the field of tissue resilience was divided into two stages: before 2020 and after 2020, taking the outbreak of the new crown epidemic in 2020 as the node.

It can be seen that the domestic organizational resilience research is not very hot before 2020, the literature is published in general, and the research topics are more fragmented. The main research hotspots in this period are: individual resilience, credibility validity, and adaptability. Since the budding stage of domestic organizational resilience, the focus of scholars has been on individual resilience in enterprises, such as enhancing individual resilience, the impact of individual resilience on enterprises and the correlation between them, while individual resilience is mainly expressed as individual adaptability and the ability to improvise; and based on this research on resilience measurement, the research on reliability and validity test criteria emerged immediately. Foreign studies in the same period showed a continuous increase in the heat, the overall number of articles, and relatively more research hotspots, such as: climate change, sustainability, community resilience, crisis, execution, strategy, adaptability, weaknesses, etc. Foreign research as a whole started earlier and is more systematic; it can be clearly found that the key words with the highest hotness (such as climate change, sustainability, resilience, crisis, etc.) have continued from 2000 until around 2020, which has lasted longer and has been the focus of research in the academic community, and some of the newborn subject words have been expanded and changed as a result; it shows that influenced by the financial crisis at that time, etc. Some scholars realized early that the ability of enterprises to improvise in the face of crisis is quite important, compared to the domestic faster

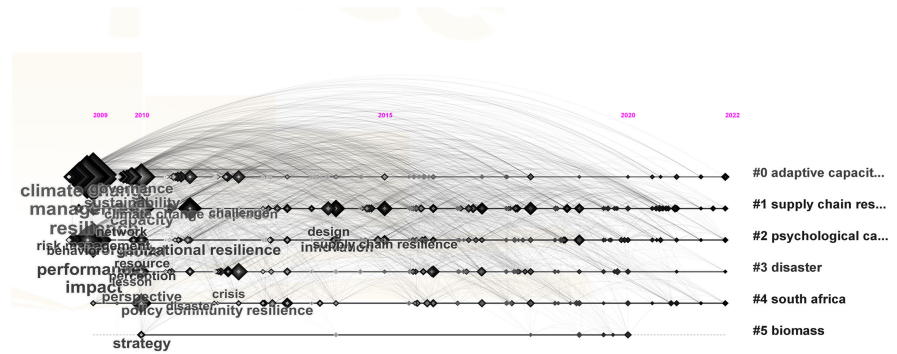


Figure 5. Time zone map of foreign tissue toughness research hotspots.

to carry out research related to organizational resilience, the key words that appeared in this time period from 2000 to 2010 can basically encompass the general scope and direction of foreign organizational resilience research in all time periods. The differences in research themes and development progress between domestic and foreign research during this period are large, and domestic research as a whole lags behind foreign research.

Influenced by worldwide public health events, domestic research topics became clearer and more focused after 2020, and the heat rose significantly, and the research hotspots at that stage were: 1) new crown epidemic, public crisis. During the epidemic, enterprises face many unprecedented multifaceted challenges, and the chain reaction caused by external crises is the root cause of hindering the development of enterprises for the topic. The academic community at this stage of the research heat correspondingly increased and reached an academic consensus on how to enhance corporate resilience to combat public crises. 2) SMEs, corporate innovation, and supply chains. Compared with SMEs, large enterprises have relatively mature organizational structures, better resilience, more stable supply chains, and better ability to adapt and coordinate in the face of unexpected crises, while SMEs are less flexible, have more constraints, less ability to respond to crises, and their supply chains are prone to break; how to improve the innovation ability of SMEs is a hot topic of research. The foreign research hotspots in this period are more refined compared with those before 2020, such as: corporate strategic objectives, supply chain, diversification, market, etc., focusing on corporate sustainability research as well as market factor research. The foreign economies were also affected by the epidemic during this period, and the same research hotspots as those in China emerged, with more specific changes in research themes than before, indicating that domestic and foreign enterprises were facing the same root problems when the real crisis came, and the academic community therefore reached a consensus on research in this special period.

4. Conclusion and Outlook

4.1. Conclusion

This study analyzes the literature of CNKI and WoS core collection databases on

organizational resilience research topics from 2000-2022, visualizes the knowledge graph with the help of CiteSpace software, composes and presents the research progress, hot areas, and development trends related to organizational resilience, clarifies the evolution of research topics and future technical points under the development characteristics of the times, and draws the following several conclusions that are drawn to provide some theoretical references for academic research.

1) Volume of publications and research trends. The search found that there are more foreign literature (2945 articles) than Chinese literature (171 articles) in the WoS core collection in the field of tissue toughness research, and the overall trend of uniform growth in the number of foreign publications, and the trend of rapid increase in the number of domestic publications since 2020, with a significantly larger increase in the number of foreign publications compared to Chinese publications. The keyword analysis and literature content combing revealed that dynamic capacity and is the hot research direction of domestic and foreign organization toughness at present and in the future, and the domestic toughness measurement method with universality needs to be supplemented and improved.

2) Collaborative relationships and development. Domestic organizational resilience research has formed a certain scale of authors and a relatively loose network of institutional cooperation, while the cooperative network and connection of foreign posting authors and institutions are relatively closer.

3) Research hotspots. In the study of foreign organizational resilience, individual resilience, supply chain resilience and risk management are hot spots; domestic hot spots are the connotation and measurement dimensions of organizational resilience, individual resilience and dynamic capabilities.

4.2. Outlook

Since the emergence of organizational resilience research, the research hotspots in the academic community have been highly variable and short-lived, with less research on emerging perspectives and elements of economic development following drastic changes in the external environment. For example, studies on dynamic perspective, supply chain and developing countries as background need to be further strengthened. Future research in the academic community can focus on the following areas:

1) Promoting a dynamic process research perspective. The keyword “dynamic capability”, which has been increasing in popularity both at home and abroad since 2020, is more relevant to the study of organizational resilience in an uncertain environment in the future. Due to the relatively short time of emergence, the theoretical foundation is not firm, although it has a certain degree of enthusiasm, but there is still room for enrichment.

2) Focus on key nodes of the supply chain research. Supply chain-related research remains an important part of future organizational resilience research,

and the supply chain resilience of SMEs directly affects the overall resilience capacity of enterprises. Although some scholars have pointed out the importance of key nodes of the supply chain to organizational resilience, there is still a gap in how organizations build resilient supply chain networks through these key nodes.

3) Focus on research in the context of developing countries and emerging economies. Developing countries are more vulnerable to unexpected events because of their inadequate infrastructure, incomplete emergency management programs, and inadequate social capital. Compared with developed countries with strong organizational resilience, the sources of organizational resilience, organizational structure, industry chain structure and individual psychological traits are worthy of comparative studies.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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