Conceptualization of Resilience. A Bibliometric Analysis

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Abstract The abstract should summarize the contents of the paper in short terms, i.e. 150–250 words. The economic and financial crises of the last decade, respectively the subprime crisis from the year 2008–2009 with the edge of the current situation caused by the COVID-19 pandemic have generated threats for many organizations around the world. It was created the premises for intensifying research on the resilience of organizations in order to understand in depth the concept itself, to establish the ability of businesses to adapt to various threats and disruptive factors. The concept of resilience is very complex and has an interdisciplinary nature, with a multitude of definitions and approaches in various areas of research. Through this study, a bibliometric analysis of the literature dealing with the concept of resilience was performed, using the WebOfScience scientific database for the period 1979–2021. The aim of the research is to evaluate the scientific output on resilience in order to have a deeper vision for the future directions of research in correlation with the evolution of economic phenomena worldwide. The general objectives are to identify the research directions of the publications in the mentioned database, to identify the articles and authors relevant for the research in the case and to map the countries that have contributed in the development of the scientific production specific to the concept. The results consist in identifying the relevant scientific production so far and the future research directions in studying the resilience of organizations for detecting their weaknesses but also the potential to return in case of a crisis or unforeseen event with major impact on the economy.

Keywords Resilience · Turbulence · Financial crisis · Bibliometric analysis · Future research

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1 Introduction

The concept of "resilience" is a very current and intensely studied term by researchers in the literature underlying the implementation of successful strategies but also the recovery of organizations operating in a difficult environment, subject to change and transformation at a pace very accelerated, unprecedented until now, in which new technologies have a disruptive role at all levels of organizations, economies but also of society as a whole. Although very intensively studied and analyzed, the concept of "resilience" is attributed to several disciplines, from psychology, engineering, information technology, economics, management, human resources, risk management but also sociology, infrastructure and ecology, each discipline offering its own definition, depending on the specifics of each, but all having a common trunk, namely that resilience is the ability to adapt and respond to various unforeseen events, difficult, disruptive and the ability to avoid and get out of crisis situations that would be could lead to interruption of activity.

The main purpose of present research is to develop a bibliometric analysis about the concept of "resilience" and to identify the relevant articles and most influent authors that brought to light this concept and to discover deeply what it really means to be resilient.

For reaching our research goal, several objectives have been considered:

- creating a comprehensive data base with all indexed publication from Web of Science between 1979 and 2021 and selecting our topic of interest, namely "resilience" from economic specter
- analyzing the publication dynamics in time and identifying the most notorious journals that published related research, author affiliation and most prolific author both in terms of citation or scientific performance based on different impact factors.
- ranking the publication based on most the number of citation
- mapping the countries with significant contribution to scientific production related to our topic
- presenting the evolution of scientific research and future directions for deeply investigation to be performed as for support in strategies and decision when unexpected events occurs. Please note that the first paragraph of a section or subsection is not indented. The first paragraphs that follows a table, figure, equation etc. does not have an indent, either.

2 Literature Review

The resilience of an entity or organization is defined in the literature by terms such as survival, recovery, recovery, sustainability. Thus, starting with 2008, with the global economic and financial crisis, the most severe after the Great Depression or the Great Recession of 1920–1930 that shook the system of the global economy, the

great researchers and economists of the world gave special importance to the analysis of resilience of enterprises, this year being a turning point in the development of scientific production dedicated to this concept. In the current stage of economic development, the resilience of organizations has come even more to the attention of economists and even regulators, along with the current economic crisis generated by the health crisis caused by the coronavirus COVID-19. Thus, the European Commission has launched the Recovery and Resilience Mechanism (EUR 723.8 billion of which loans amounting to EUR 385.8 billion and grants amounting to EUR 338 billion) which aims to protect the population and companies directly or indirectly impacted, either by measures imposed by the authorities on free movement, either due to staff shortages, supply or distribution chain problems, and measures to recover the economy from the devastating impact of the pandemic, with the ultimate goal of supporting the economies of European countries to become sustainable, resilient and prepared for future challenges.

Ates & Bititci (2011) show that the resilience of an organization is a vital ability of an organization to survive in a turbulent economic environment and continuous reinvention through innovation makes them more resilient and sustainable over time.

An insight into the resilience of organizations is also provided by Sutcliffe & Vogus (2003) showing that this means how an organization continues to achieve favorable results in the context of obstacles and barriers that suppress its development or evolution. In other words, resilience shows the ability of an organization to absorb the shock of turbulence and to recover or even to improve and move to a higher level as a result of adverse events or adversities.

Another interesting definition issued by Biggs et al. (2015) shows that the resilience of an organization lies in their ability to operate despite the difficulties and crises that affect it, managing to maintain or even increase the level of income and number of employees. Thus, it delimits several factors that were supposed to be associated with the resilience of enterprises, namely the values of the organization, share capital, human capital, financial capital (average income, profit, indebtedness rate—asset to liabilities ratio, and access to finance).

The scientific literature analyzed is quite poor when we talk about bibliometric analysis regarding resilience, most of them focusing more on supply chain management analysis instead of resilience as a big picture and with a much smaller sample than our research. There are several studies related to our research but we will lean on a few that we consider to be going in the same direction with our analysis. Shymon (2020) performed an analysis of economic resilience identifying 4 core scientific schools based on a bibliometric analysis on economic resilience using the software VOSviewer and proving that core indicators of economic resilience assessment are macroeconomic stability; microeconomic market efficiency; good governance; social development.

In a recent study, Raetze (2021) based on a bibliographic analysis of 1,667 articles proved once again resilience is an important concept in organization-related research but there were found some fallacies, meaning that existing conceptualizations of resilience has different interpretations, the author trying to build an agenda for future research.

Last publication, also coming from 2021 by Fernandes is the first research that is centered on systematic analysis of entrepreneurial resilience and forms of collaboration, based on a systematic analysis of the literature with a sample of 97 publications aiming to develop a conceptual framework and finding future lines of research.

3 Methodology

The research begins with the analysis of scientific production over the years dealing with the topic of "resilience", with the stated purpose of obtaining a global and detailed picture of scientific production in relation to the topic studied so far and to outline directions of future research on the topic under analysis. Thus, the database for bibliometric analysis was built by querying the WebOfScience database by searching for the keyword "resilience" and using Bibliometrix as a bibliometric analysis software. Analyzing the studies published over time on resilience, a number of 135,458 search results were generated, mostly in the field of environmental science or studies (24,624) or ecology (8,640). After refining the results, choosing what interests us directly through this study, respectively the fields of Management, Economics, Business or Business Finance, there were 6,888 records left including articles, proceeding papers, books, book reviews or articles, abstract, all these publications between of 1979–2022.

The bibliometric analysis was performed taking into account the database thus obtained, respectively the sample consisting of 6,888 papers published in 1,505 journals, the database which is constantly expanding due to the interest of researchers in the topicality and importance of the topic, being selected every year in which there were indexed works about the topic "resilience", the first year there were found publications is 1979. All types of publications were considered, from the 4 areas related to the economic field, including all institutions of the authors, all the regions, respectively the countries that generated scientific production in connection with the researched topic, which made possible a global mapping of the scientific production and with a high quality of research. Finding research niches, research topics that crystallized around the main pillar analyzed, respectively "resilience", the links that are established between them and their intensity as well as identifying future research niches was possible using the Bibliometrix software.

4 Results and Discussions

4.1 The Main Characteristics of the Authors

The scientific production that analyzes the topic "resilience" begins in 1979, when it was the first publication indexed in the WoS database, and until 2005, the topic

was little studied, the importance given to its research has a significant advance since 2011 and the peak is reached in 2021 with a number of 954 publications. The Fig. 1 illustrates the evolution over time of the annual scientific production indexed in the WoS database which aims at the research topic "resilience". Until 1999, less than 10 research publications on this topic were dedicated annually, sometimes for years completely out of the sights of researchers, without even being a publication dedicated to the topic, the next decade the number of publications did not exceed 100 annually, but starting with 2011, after the great economic crisis of 2008–2009, the topic came to the center of researchers' attention, the number of dedicated articles increasing rapidly every year, which shows the importance and relevance of the research topic. The papers have been published in numerous international journals and conferences, respectively 1,505, in quartiles from Q1 to Q4. Most publications have appeared in the economics and management journals Ecological Economics (193), Disaster Prevention And Management (166) and World Development (129). Other top-ranked journals include Energy Policy (89), Technological Forecasting And Social Change (70), Regional Studies (61), which gives a note of importance to the researched topic and gives the possibility to find new research directions related to the analyzed topic.

At the same time, the affiliation of the authors to prestigious academic and educational institutions at international level, makes the level of quality of knowledge surprised in the published works and which are part of the analyzed sample to have a high scientific level. The University of Stockholm with 113 publications, Cambridge University with 93 publications and Oxford University with 92 publications on resilience. The number of institutions to which the authors of the studies are affiliated is impressive, respectively 4,551, among these there are also top academic

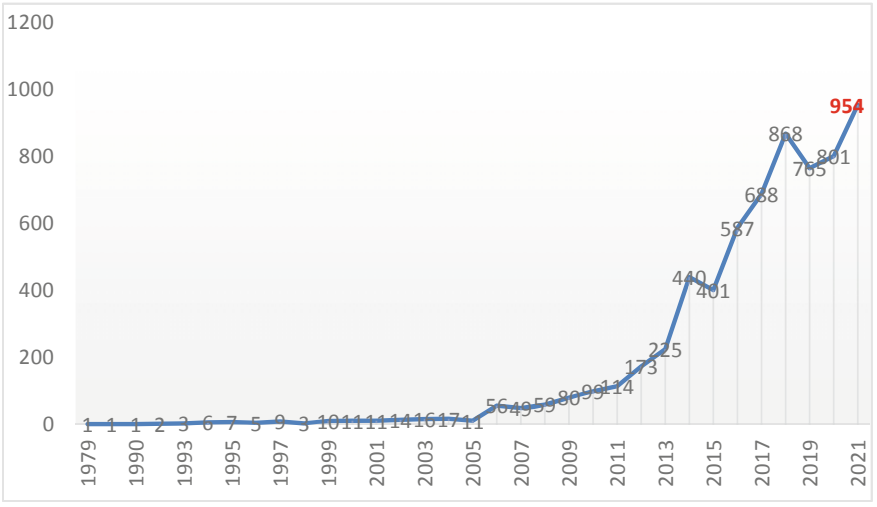

Fig. 1 Annual scientific production. *Source* Own processing based on data obtained from WebOfScience

institutions in Romania, such as the University of Bucharest, the "Babes Bolyai" University of Cluj or the Al. I. Cuza from Iasi. At the same time, important to be mentioned is that the vast majority of journals in the top of the most prestigious business journals, the Financial Times, FT50 ranking of business school journals that are part of the FT Global MBA, Executive MBA or Online MBA they published at least one article related to the researched topic, "resilience". These include the Academy of Management Journal, Academy of Management Review, Econometrics, Administrative Science Quarterly, Entrepreneurship Theory and Practice, Harvard Business Review, Journal of Financial and Quantitative Analysis, Journal of Financial Economics, M IT Sloan Management Review which means that the topic is in an obvious ascent regarding the importance that it deserves in the economic and social life at world level as well as a constant increase of the visibility among the researches ensuring at the same time new research directions related to this topic.

The most prolific authors who have devoted to detailed research on "resilience" and who have published more than 20 papers are in order Amaratunga D. (37 publications), Haigh R. (28 publications), Na Na (23 publications) and Ivanov D. (21 publications). The ranking according to the impact and prestige of the authors who performed research on the studied topic, is presented in the Table 1, in order H Index highest. The author with the greatest impact is Luthans F., with an H Index 17 that has the most citations (6328), starting the research in the field in 2007. His most important work, considering the number of citations (1356) is "Positive psychological capital: Measurement and relationship with performance and satisfaction" and comes from the year in which the author debuted, respectively 2007.

Table 1 Authors' impact

No	Author	H_index	G_index	M_index	TC	NP	PY_start
1	Luthans, F	17	17	1,133	6328	17	2007
2	Avey, JB	11	11	0.733	4531	11	2007
3	Blackhurst, J	11	12	0.733	1296	12	2007
4	Ivanov, D	10	17	–	968	17	–
5	Martin, R	10	11	0.833	2310	11	2010
6	Amaratunga, D	9	14	0.75	278	32	2010
7	Linnenluecke, MK	8	8	0.8	564	8	2012
8	Danes, SM	7	8	0.636	119	8	2011
9	Haigh, R	7	11	0.875	162	2. 3	2014
10	Maler, KG	7	7	0.259	805	7	1995
11	Perrings, C	7	11	0.25	691	11	1994
12	Wang, J	7	10	–	317	10	–
13	Yang, Y	7	9	0.778	157	9	2013

Source Own processing based on data obtained from WebOfScience and Bibliometrix

4.2 The Main Features of the Relevant Publications

The most cited work indexed in WoS and dealing with the subject of "resilience" comes from 1993 by the American author Weick KE, a work that has by far the most citations, respectively 1916 citations and which is called "The Collapse of Sense making in Organizations: The Mann Gulch Disaster". The author, a professor at the University of Michigan, is a well-known researcher of organizational theory, introducing several concepts in the literature, including "loose coupling" or "mindfulness." The Table 2 lists the top 15 most cited. Their impact weighs heavily in the literature dedicated to the concept of "resilience" taking into account that a small number of works, respectively 0.2% have over 11% of the total number of citations.

Next in our research, we will perform a detailed review based on the bibliometric analysis presented above. The purpose of the analysis is to reach a result that ends with a conclusion that describes the intensity of the phenomenon studied. In the Table 3 are analyzed the first 5 most cited articles, selected from the previously mentioned sample, the main results obtained being mentioned in the below in the table.

4.3 Geographic Mapping of Publications

Carrying out the geographical mapping of the countries that contributed to the evolution of research on the topic of "resilience", it can be seen from the Fig. 2 that the United States contributes substantially to global scientific production, thus confirming the supremacy and obvious interest in being an important generator of scientific production, respectively 4050 publications, followed by developed countries such as UK (2872 publications), Australia (1222 publications), Italy (1109 publications), Germany (917 publications) or China (908 publications), all this showing the importance and topicality of the researched topic. Romania is in the top 20 globally with 223 publications, the interest shown by researchers in outlining definitions of resilience and finding the factors that influence in both directions the resilience and resilience of an entity, being generated by the impact it has the theme both at the economic, financial, social level, but also at the level of the environment so that the evolution of the society as a whole has a sustainable and sustainable theme in the long run.

4.4 Evolution of Research Topics

The results obtained by sequencing the database using the bibliometric analysis software Bibliometrix, show that the term "resilience" is the most common. The co-occurrence network presented in the figure below generated based on the keywords "keyword plus" is a conceptual map that illustrates as suggestively as possible the

Table 2 The 15 most-cited articles

No	Author	Year	Paper	Total citations (WoS)	Citation density (TC per Year)	Normalized TC
1	Weick KE	1993	The Collapse of Sensemaking in Organizations: The Mann Gulch Disaster	1916	66,069	2.83432
2	Luthans F	2007	Positive Psychological Capital: Measurement and Relationship with performance and Satisfaction	1356	90.4	14.67079
3	Adger WN	2003	Social capital, collective action, and adaptation to climate change	1214	63.8947	7.49383
4	Moberg F	1999	Ecological goods and services of coral reef ecosystems	1001	43.5217	4.95299
5	Korhonen J	2018	Circular Economy: The Concept and its Limitations	743	185.75	78.17261
6	Gomez-Baggethun E	2013	Classifying and valuing ecosystem services for urban planning	729	81	22.60855
7	Hobfoll SE	2018	Conservation of Resources in the Organizational Context: The Reality of Resources and Their Consequences	723	180.75	76.06836

(continued)

Table 2 (continued)

No	Author	Year	Paper	Total citations (WoS)	Citation density (TC per Year)	Normalized TC
8	Craighead CW	2007	The severity of supply chain disruptions: Design characteristics and mitigation capabilities	698	46.5333	7.55178
9	Youssef CM	2007	Positive organizational behavior in the workplace - The impact of hope, optimism, and resilience	658	43,8667	7.11901
10	Wanberg CR	2000	Predictors and outcomes of openness to changes in a reorganizing workplace	609	27.6818	6.67896
11	Simmie J	2010	The economic resilience of regions: towards an evolutionary approach	608	50.6667	8,94,782
12	Martin R	2012	Regional economic resilience, hysteresis and recessionary shocks	607	60.7	19.74262
13	Sitkin SB	1992	Learning Through Failure - The Strategy Of Small Losses	585	19.5	1.9797
14	Avey JB	2011	Meta-Analysis of the Impact of Positive Psychological Capital on Employee Attitudes, Behaviors, and Performance	585	53.1818	12.73439

(continued)

Table 2 (continued)

No	Author	Year	Paper	Total citations (WoS)	Citation density (TC per Year)	Normalized TC
15	Luthans F	2007	Emerging positive organizational behavior	584	38,9333	6.31839

Table 3 The synthesis of the main impact studies on the researched field

Author/year	Treated concepts/keywords	Result	Timeliness and impact on research
Weick (1993)	Resilience, vulnerability, crisis, leadership	The author defines 4 sources of resilience of groups or organizations (1) improvisation and DIY, (2) virtual role systems, (3) the attitude of wisdom (4) respectful interaction	Starting with a disastrous fire in Mann Gulch, Montana that was described in Norman Maclean's Young Men and Fire (1992) The author tries to find answers to 2 questions, namely why organizations are falling apart and how can organizations be more resilient. The author extrapolates the reactions and the mode of action of a small group in a crisis situation at the level of an organization The impact is low, the paper tries to be a theorizing of organizational culture and group leadership, without presenting elements that would help define the term resilience or more to draw clear directions for future research

(continued)

Table 3 (continued)

Author/year	Treated concepts/keywords	Result	Timeliness and impact on research
Luthans (2007)	Psychological Capital, Hope, Optimism, resilience, satisfaction,	The results of the study have practical implications for the motivational development and management of employees. Although it is generally invested in financial, human and social capital, the study's findings show that investing in psychological capital can generate substantial profits compared to other forms of capital investment	The article analyzes the resilience from a psychological perspective, as an essential element for increasing efficiency and employees The authors mention four components of psychological capital (eq individual motivational tendencies) namely efficacy, optimism, hope, and resilience Resilience is thus defined as a positive adjustment or dealing with an adverse event that involves a significant risk. Resilience shows a return to normalcy or overcoming a failure or a positive progress or improvement in an individual's evolution The study has a moderate impact and the information is up to date. The positive aspects are that the work defines resilience in several forms but not from an entrepreneurial perspective nor does it find attributes or components of it so that it can be objectively appreciated or synthesized in a specific phenomenon or to find the elements that influences resilience to define a specific index

(continued)

Table 3 (continued)

Author/year	Treated concepts/keywords	Result	Timeliness and impact on research
Adger (2003)	Social capital, resilience, vulnerability	Research highlights three key elements in adapting to the extreme difficulties that may arise at a given time, taken from specific cases related to climate risks and which can be generalized at the level of organizations, namely: (1) adaptability depends on culture and the specific place (2) the nature of the risk, the institutional context but also the homogeneity of the decision-making group and the benefits to management are important elements in the collective action of adaptation to difficulties (3) theories of social capital allow generalization	The study examines how climate change causes changes in society and adaptation as a dynamic social rock is determined by society's ability to act collectively. Social capital is increasingly applied in the economy being based on trust, reputation and mutual action. The article presents various case studies in which collective actions are carried out in order to cope with the extreme weather conditions in the coastal areas of Southeast Asia and the Caribbean. The case study presented shows the importance of social capital that contributes to increasing resilience to the risks of climate change and by analogy illustrates the nature of adaptation processes and collective action to adapt to future climate change In conclusion, the research is well-founded, current and the influence is medium, the basic idea extracted from the text analysis being that resilience increases when acting concentrated, collectively to overcome the disturbances that occur at a time, given that lead to imbalances

(continued)

Table 3 (continued)

Author/year	Treated concepts/keywords	Result	Timeliness and impact on research
Moberg (1999)	Management; Biodiversity; Resilience; Valuation	The results of the study show once again that the actions of the external environment influence the resilience and the ability to return in an irreversible way if we do not act in time with complex measures	The study analyzes the impact of human action on coral reefs and the consequences on the loss of their resilience Although, the field it treats is the ecological one, still some conclusions after the analysis of the study can be transposed on the resilience of the business, considering that the ecosystem in which it operates has an influence worthy of being taken into account. Therefore, we can conclude that the study is topical and the impact on our research is medium to high The external environment often irreversibly affects the resilience and thus the return to normalcy is endangered At the same time, although each business has its own specificity, they are similar and act in the same direction, namely to make a profit, but each has its own capacity for resilience and an ability to absorb and react to external disturbances in a completely different way In addition to external causes, the decrease in resilience is caused by inefficient management of resources as well as management decisions inadequate to the moment in the evolution of the business, erroneous decisions or delayed reactions to changes or disruptions to the external environment

(continued)

Table 3 (continued)

Author/year	Treated concepts/keywords	Result	Timeliness and impact on research
Korhonen (2008)	Circular economy, sustainability	The results of the study are that six directions or challenges are identified that are urgently needed to be addressed and addressed by the states of the world to support global sustainability, thus outlining future research niches so that the circular economy supports sustainable development	The study analyzes the concept of circular economy, which although it is a very popular term both at the level of public administrations (European Union or governments of some countries) and at private level, however the studies do not have a very organized direction and the analysis is quite superficial. The study is delimited in two main directions, one in which it defines the concept from the perspective of sustainable development and sustainability and a directive in which a critical analysis of the concept from the perspective of environmental sustainability is performed The study is very topical considering all the steps taken to combat pollution and reduce the carbon footprint, but the impact on our research is small, the direction we want to explore is different from that of the study

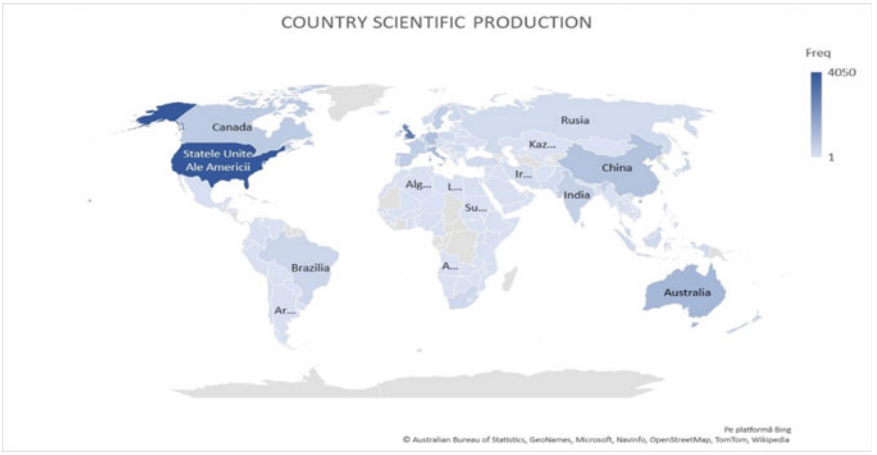

Fig. 2 Mapping of countries with contribution to the scientific production. *Source* Own processing based on data obtained from WebOfScience and Bibliometrix

components of scientific production related to the researched topic "resilience" simultaneously with the cognitive structure of the research, existing three clusters central in which each node represents a semantic concept of different dimensions depending on the frequency of occurrence and the degree of importance of each line between two nodes showing the intensity of the relationship between concepts presented.

At the same time, in order to capture the evolution of research topics in relation to the main topic analyzed, throughout history, a two-dimensional diagram was generated, taking into account as a parameter according to which the grouping of research topics is made, the keyword plus with the most appearances in the reference period 1979–2022. Following the analysis, three such clusters were identified with the help of the Bibliometrix program, respectively resilience, performance and innovation, having as reference axes the centrality (degree of relevance) and the density of topics (degree of development), as we can see in Fig. 3.

The size of the spheres in the diagram it is influenced by the number of keywords plus and it can be seen that in the analyzed period the theme of resilience dominates in the published research papers with 1159 appearances, followed by management with 697 appearances and performance with 635 appearances. The most popular research topic in the analysis period, both in terms of the appearance of keywords plus and the number of keywords plus that are part of the cluster (60 words) is resilience. But the theme of performance is considered as a motor theme having included in its cluster keywords plus among which we can list: performance, impact, model, behavior, health, stress, conservation, disruptions (Fig. 4).

At the same time, the theme of resilience is affiliated basic theme which has a very high density but not very strong links with the other identified themes but which will generate strong links in the next period. All these research topics have evolved over time and have transformed with the emergence of new areas of interest creating links

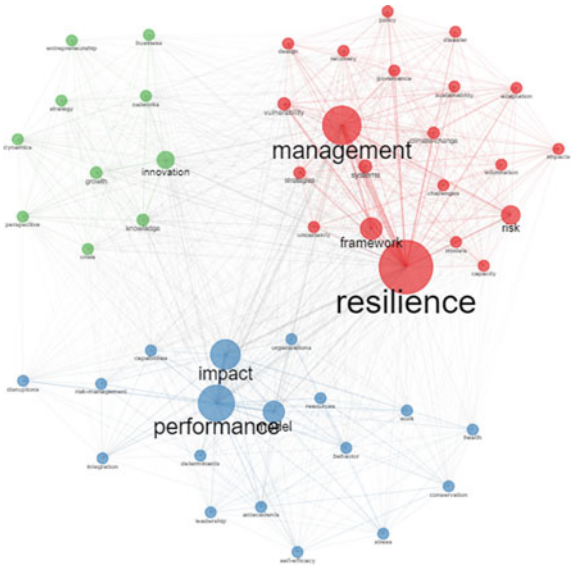

Fig. 3 Co-occurrence word network. *Source* Own processing based on data obtained from WebOfScience and Bibliometrix

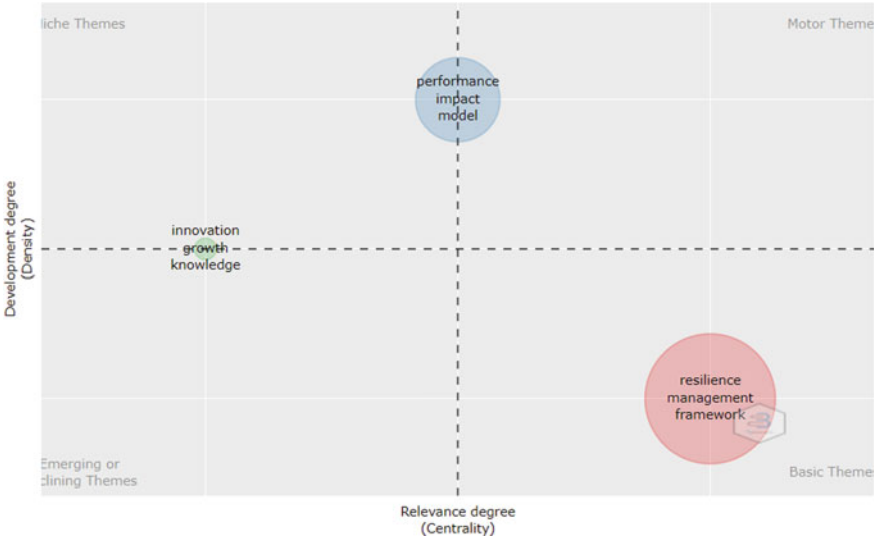

Fig. 4 Thematic map representation *Source* Own processing based on data obtained from WebOfScience and Bibliometrix

of various intensities with other topics with the emergence of some or the occurrence of significant events in local or global economies. Keywords plus that are part of this cluster are topics such as resilience, management, framework, risk, strategies, governance or sustainability.

Innovation is included in the category of niche topics with a development potential for the next period, the research focusing on keywords such as innovation, growth, knowledge, entrepreneurship or even technology.

5 Conclusion

The present paper wanted to carry out a rigorous and detailed research on scientific production that deals with the topic of resilience, with the precise purpose of deepening and substantiating the concept but also to predict the new directions of research in this field. Given the current context but also in order to make relevant comparisons over time, we considered it appropriate to scan the entire portfolio of research papers in the WebofScience database, so that from the first appearances of dedicated works in 1979 and until now, the relevant scientific production is significant, only taking into account the specific fields of economics (Management, Economics, Business or Business Finance) there are almost 7000 publications in a large number of journals (over 1500), which shows the importance and topicality of the topic studied, the peaks being registered mainly after the crisis of 2008–209 and the current economic crisis generated by the COVID pandemic.

The scientific level and quality of knowledge present in the published works that study the concept of resilience is very high, having the prestige of authors who have dedicated works to this concept but also the affiliation of authors to some of the most prestigious educational and research institutions in the world.

In conclusion, the paper aims to present the level of knowledge on resilience so far and to provide an opportunity to answer questions related to future research directions on resilience, research that should focus on topics such as measuring the resilience of organizations, identification of indices to measure the resilience of enterprises, so that differentiated management strategies can be issued according to the weaknesses identified within each organization, all in order to build a sustainable organization capable of absorbing the shocks of any turbulence or adverse events that to continually reinvent oneself and return much stronger after such events.

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