Research Article

Bibliometric Analysis of Studies on the Concept of Vuca

Fatih İbrahim KURŞUNMADEN[1]

1. Assist. Prof., Selçuk University, Department of Foreign Trade, kursunmaden@selcuk.edu.tr, ORCID: 0000-0003-4045-9003

Abstract: This study aims to examine the VUCA concept with the bibliometric analysis method. Within the framework of this main objective, this article examines 610 studies in the SCIEXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI databases according to chronology, discipline, source, country, author and keyword parameters is analyzing. The data set consists of studies published between 2008-2024. Information regarding studies on VUCA was taken electronically from the Web of Science database and transferred to the R program. All calculations and operations on tables and graphs were carried out through the Rstudio program. According to the analysis results, it has been determined that the VUCA issue is an area that has increased and developed significantly in the last 5 years. The results obtained are important in terms of revealing the general status of studies on this subject. The study offers a wide range of trends or concentrations in terms of scientific fields, countries and thematic areas. Our results may facilitate the planning, design, conduct, and publication of future research on this topic.

Keywords: VUCA, Bibliometric Analysis, Web of Science
Jel Codes: M10, M14, M19

Vuca Kavramına İlişkin Çalışmaların Bibliyometrik Analizi

Öz: Bu çalışma ile VUCA kavramının bibliyometrik analiz yöntemiyle incelenmesi amaçlanmıştır. Bu temel amaç çerçevesinde, bu makale SCIEXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI veri tabanlarında yer alan 610 çalışmayı kronoloji, disiplin, kaynak, ülke, yazar ve anahtar kelime parametrelerine göre analiz etmektedir. Veri seti, 2008-2024 döneminde yayınlanan çalışmalardan oluşturmaktadır. VUCA konulu çalışmalara ilişkin bilgiler Web of Science veri tabanında elektronik ortamdan alınarak R programına aktarılmıştır. Tüm hesaplamalar ile tablolara ve grafiklere yönelik işlemler Rstudio programı üzerinden gerçekleştirilmiştir. Analiz sonuçlarına göre, VUCA konusunun son 5 yılda önemli ölçüde artan ve gelişen bir alan olduğu belirlenmiştir. Elde edilen sonuçlar, bu konudaki çalışmaların genel durumunu ortaya koyması açısından önem arz etmektedir. Çalışma bilimsel alanlar, ülkeler ve tematik alanlar açısından geniş bir eğilim veya yoğunlaşma yelpazesi sunmaktadır. Çalışmanın sonuçları bu konu hakkında gelecekteki araştırmaların planlanmasını, tasarlanmasını, yürütülmesini ve yayınlanmasını kolaylaştırabilir.

Anahtar Kelimeler: VUCA, Bibliometrik Analiz, Web of Science
Jel Kodları: M10, M14, M19

Cite: Kurşunmaden, F. İ. (2025). Bibliometric analysis of studies on the concept of vuca. *Fiscaoeconomia, 9*(2), 927-938. https://doi.org/10.25295/fsecon.1586089

Submitted: 15.11.2024
Accepted: 03.01.2025

1. Introduction

The term VUCA (Volatility, Uncertainty, Complexity, Ambiguity) was first introduced by the American Army to describe the variability, uncertainty, complexity and ambiguity of general events after the Cold War (Kinsinger & Walch, 2012; Codreanu, 2016). In the field of business management, the concept of VUCA was first defined by New York Times columnist Thomas Friedman. Friedman analyzed high-tech companies and observed that companies such as Google, Apple, and Amazon quickly adapted and implemented high technology (Nandram & Bindlish, 2017). This concept later began to be

widely used in the business world and leadership literature (Bennett & Lemoine, 2014). Although VUCA is considered a new concept that explains the dynamic, complex and uncertain nature of the modern business world, when we look at the sub-dimensions, we can see the concept of VUCA in many moments of humanity throughout history. Today, these features have become universal, gaining an official dimension (Acatrinei, 2017). It is seen that the VUCA concept has been adopted by senior managers in recent years in order to overcome the challenges posed by various external factors such as technology, economy, environment and politics (www.emergingworld.com, 2024). In today's business life, it has become difficult to define which activities are correct and under what conditions these activities should be carried out (Kaivo-oja, 2018). Today's chaos and life phenomenon; the mindset that leaders need is to know what is uncertain and to know that they need to be prepared for constant change and risks that may occur. The idea emerges that leaders and organizational members can cope with this chaotic environment by resisting (Mofuoa, 2016). VUCA consists of four key components: Volatility, Uncertainty, Complexity and Ambiguity. These components express the different challenges faced by the business world and strategies to cope with them (Bennett & Lemoine, 2014). Variability refers to the speed and unpredictability of environmental changes. These changes are often sudden and unexpected and may result from market dynamics, technological innovations or political events. In an environment of high variability, organizations must adapt to rapidly changing conditions. For example, the sudden introduction of a new technology may require companies to engage in a rapid adaptation process. In order to cope with variability, organizations need to be flexible and agile and have quick decision-making mechanisms (Lawrence, 2013). When the studies conducted are examined; the agile approach is seen as the way to prevent the variability experienced in the world and to be prepared for the changing conditions that occur (İnal et al., 2021). When a change situation caused by variability occurs, the way to eliminate it is to use the resources available to improve agility. It is stated that the nature, capacity and magnitude of change (Horney, 2010) can occur rapidly and in varying dimensions, depending on the situation (Bennett & Lemoine, 2014). Regardless of the size of the change, it is the opinion that presenting a shared vision as a solution proposal that will ensure the continuity of organizations will be sufficient to reduce the current impact of variability (Yurdasever & Fidan 2020).

The aim of this study is to make a bibliometric analysis of VUCA concept. In the research, the concept of VUCA in the Web of Science was chosen as the subject and focused on 610 studies conducted from 2008 to 2024. In order to set a clear time frame for our study, data collection ended in July, 2024 and the articles with online availability as of that date were not considered in the analysis. In addition, the studies included in the Web of Science core collection SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCISSH, BKCI-S, BKCI-SSH, ESCI indexes, which were formed as a result of this limitation, were taken as the scope. Information on the articles on VUCA were taken from the Web of Science database electronically and transferred to the R program, and all calculations and operations for tables and graphics were carried out through the Rstudio program.

2. Literature

The concept of VUCA consists of the first letters of the words Volatility, Uncertainty, Complexity, Ambiguity. The elements that make up the VUCA concept are explained in detail below.

Uncertainty, a problem at the level of predictability or lack of cases (Horney, 2010), is one of the VUCA dimensions used to explain a differentiated phenomenon. Uncertainty refers to unpredictable situations about what will happen in the future. Uncertainty does not mean variability. In addition, uncertainty may not contain enough variability to mean much, or there may be no change in this situation. Uncertain situations arise when there is not enough information flow, and therefore it is important to have information, even if it is easy, to handle this situation (Bennett & Lemoine, 2014). Lack of information or

unreliability of available information creates uncertainty. In the business world, issues such as how a new market will react or how legal regulations will change can create uncertainty. Uncertainty complicates decision-making processes and requires organizations to focus more on risk management. Leaders should determine a clear vision and strategy to deal with uncertainty and guide their employees in line with this vision (Millar, Groth & Mahon, 2018).

Complexity refers to the situation where many factors interact together and depend on each other. The relationships between these factors are often multilayered and difficult to understand. Global supply chains, operations of multinational companies and international regulations are factors that increase the complexity in the business world. Complexity arises when cause-effect relationships are unclear and many variables act simultaneously. To deal with complex structures, leaders need to use analytical and systematic thinking skills. This makes complex structures easier to understand and manage (Snowden & Boone, 2007). Complexity is the situation where the problems in organizations and the resulting chaos are mixed together (Horney, 2010). There are many interrelated factors in complex environments. Change occurring anywhere has an impact on the entire environment. This situation causes the existing level of complexity to increase (Yurdasever & Fidan 2020).

Ambiguity refers to situations where information and situations are unclear or may have more than one meaning. Ambiguity in business often occurs in situations where there is ambiguous or conflicting information. Uncertainties encountered when evaluating the potential of a new market or unclear information about the areas of use of a new technology can create ambiguity. Ambiguity makes it difficult for organizations to engage in strategic planning and requires creative thinking and flexibility. Leaders can overcome such challenges by developing innovative approaches and showing flexibility in situations of ambiguity (Johansen, 2012). Ambiguity is one of the most challenging components that organizations and leaders face. In this environment where traditional management approaches are inadequate, it is critical to adopt innovative and flexible approaches. Effective management of ambiguity enables organizations to be more resilient and competitive in the face of uncertainty.

Some of the highlights of previous studies on VUCA are included in this part. For example, Shaffer & Zalewski (2011) stated in their research that the rapid change in the business world significantly affects the career planning of university students. Lawrence (2013) revealed a new perspective for leaders developing in the VUCA environment and investigated how VUCA and leadership development are interconnected by making an in-depth examination of the VUCA PRIME concept. In his study, Euchner (2013) interviewed Bob Johansen, who is considered one of the pioneers of comprehensive studies on VUCA and leadership. He expressed the opinion that the VUCA environment and the new developments that come with it will deeply affect the future, and therefore, new leadership skills are necessary in order to read the future well. In their study, Bennett & Lemoine (2014) revealed what the VUCA concept means for businesses and managers. They stated that it should be clearly stated what these four sub-dimensions mean and what the differences between them are in the complex world order.

Saini & Khurana (2015) examined organizational transformation management in the VUCA period in their research. It has been stated that many organizations look at business transformation as a savior, but the difficulties and obstacles encountered during the transformation process negatively affect these transformation activities. Lemoine et al. (2017) examined the relationship between global higher education and VUCA in their study. They stated that technological change, rapid population growth, economic conditions, uncertainty and chaotic environment in the field of education significantly affect students' performance. They stated that higher education institutions should pay attention to the VUCA cycle in their current and future planning. In their study, Millar et al. (2018) discussed the concept of "management innovation" in the VUCA world, where established patterns and models lose their influence day by day. In the challenging and

unpredictable VUCA world, they have made various recommendations about the possible challenges that businesses may face and how to combat these challenges.

Kaivo-oja & Lauraeus (2018) examined the VUCA approach as a solution to global technological disruption. The research findings listed the key issues regarding modern management in the VUCA world as follows; agility against volatility, knowledge management against uncertainty, restructuring against complexity and experimentation against ambiguity. It has been stated that the VUCA approach is extremely important for technological disruption. In her study conducted, Krawczyńska-Zaucha (2019) studied a new management and leadership paradigm by systematically evaluating the features of the VUCA world. At the end of the research, it was stated that leaders in the VUCA world face many challenges. The biggest challenge of the VUCA world is stated by its leader as the destructive change of the environment in which it operates. In their study conducted, Hadar et al. (2020) examined to what extent students were ready for the new conditions called the VUCA world. Survey data was collected from 54 university students and 24 faculty members. Additionally, semi-structured interviews were conducted with 16 faculty members. Research results have shown that students seriously struggle with VUCA conditions. In his study conducted, Karakaya (2020) focused on the importance of enterprise risk management (ERM) in the VUCA environment and a model proposal for higher education institutions after the Covid-19 epidemic. As a result of the research, it was stated that ERM is one of the most effective managerial tools that can be used in the VUCA environment and that systematic planning and implementation of ERM plays a key role in solving the problems that have become more evident during the VUCA period.

In their study, Rodionov et al. (2021) revealed the impact of the VUCA world on students' vocational education and competitiveness. Research results have shown that students in the VUCA world are more prone to technological developments and have independent and creative features that can solve problems in interaction. In their study conducted, Dhillon & Nguyen (2021) revealed which strategic responses organizations can adopt to protect and sustain their existence in the VUCA world. While the study interprets organizational structure and culture as two important factors at the macro level in the VUCA world, at the micro level there are findings on what skills managers should have and how to obtain and use qualified managers. In their research conducted, Troise et al. (2022) examined the impact of three features of agility, namely digital technology ability, relational ability and innovation ability, on financial performance, product and process innovation. Research findings have shown that agility has a positive impact on business performance and digital technologies play a key role in the success of SMEs. Additionally, it has been stated that these three features contribute to creating corporate agility in SMEs.

When the concept of VUCA is examined, it is seen that it has been studied in many fields and many disciplines. Therefore, it cannot be said that the VUCA concept serves certain fields of science. VUCA manifests itself in every field of work in which human beings work. It is seen that the concept of VUCA is discussed in many areas such as management, leadership, finance, economy, logistics and education. While a significant portion of the studies on the subject have been carried out abroad, the number of studies on VUCA in the country is quite low. In the last few years, the interest of researchers in our country in VUCA has increased. While most of the studies on this concept are on leadership skills and training programs, there are few studies on VUCA in the field of sectoral and strategic management.

3. Method

In this study, studies on the concept of "VUCA" were examined through bibliometric analysis and the obtained data were presented with visual mapping technique. Bibliometric analysis includes the authors, keywords, origin, citations, affiliated institutions of the authors, sources and publication years of academic publications in a particular field. It is based on mathematical and statistical methods with the help of data

(Lawani, 1981; Say, 2023). Therefore, bibliometric analysis has been preferred in this study because it has an infrastructure that can help comprehensive reviews and minimize researcher errors (Donthu et al., 2021).

The keyword "VUCA" was written on the WoS platform and a search was made according to the "topic" setting. As a result of the limitation made in the subject category. In this study, the WoS database was preferred. Because WoS is a pioneer among scientific literature databases in the field of social sciences and includes the minutes of international conferences, symposia, seminars, workshops and congresses (Martinez et al., 2015).

4. Findings

In this part of the research, Table 1 provides information on all studies on the concept of "VUCA" published in journals indexed in SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCISSH, BKCI-S, BKCI-SSH, and ESCI.

Table 1. Main Information About Data

Timespan	2008:2024
Sources (Journals, Books, etc)	359
Documents	610
Annual Growth Rate %	25,1
Document Average Age	2,79
Average citations per doc	5,779
DOCUMENT CONTENTS	
Keywords Plus (ID)	878
Author's Keywords (DE)	2190
AUTHORS	
Authors	1564
Authors of single-authored docs	150
DOCUMENT TYPES	
article	312
article; book chapter	29
article; early access	25
article; proceedings paper	3
article; retracted publication	1
book	1
book review	3
editorial material	20
editorial material; book chapter	1
letter	2
meeting abstract	5
proceedings paper	186
proceedings paper article	1
review	19
review; early access	2

According to the Figure 2, a total of 312 articles published between 2008 and 2024 were written by 1564 authors. The majority of the studies on the concept containing the information given in Table 1 constitute articles. It is seen that there are 610 studies in a

total of 359 sources from the first study on the subject in 2008 until July 2024. It is also seen that the average citations per documents are 5,779.

The distribution of studies included in these indices regarding the VUCA concept by web of science categories is given in Figure 1.

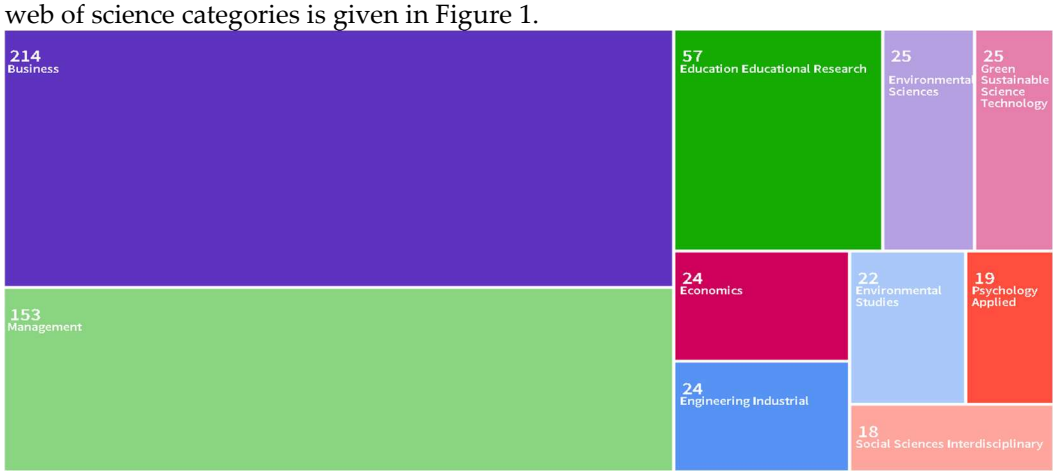

Figure 1. Web of Science Categories

According to Figure 1, it is understood that the first 3 fields where the most studies are carried out are business, management and educational research.

Figure 2 below shows the most relevant authors

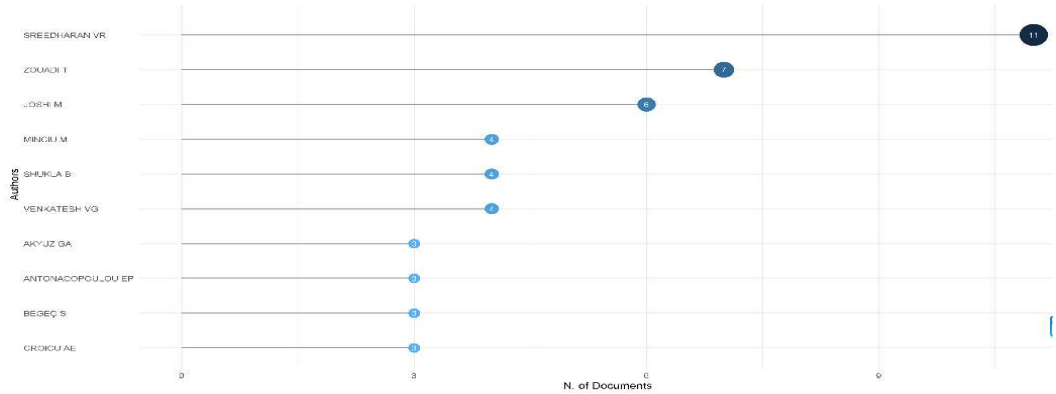

Figure 2. Most Relevant Authors

When the author network is examined from a relational perspective in the Rstudio program, the most productive authors are Sreedharan VR., Zouadi T., and Joshi M. The image above includes the most relevant authors.

Figure 3 shows the works of authors working on the VUCA concept by year as a result of bibliometric analysis.

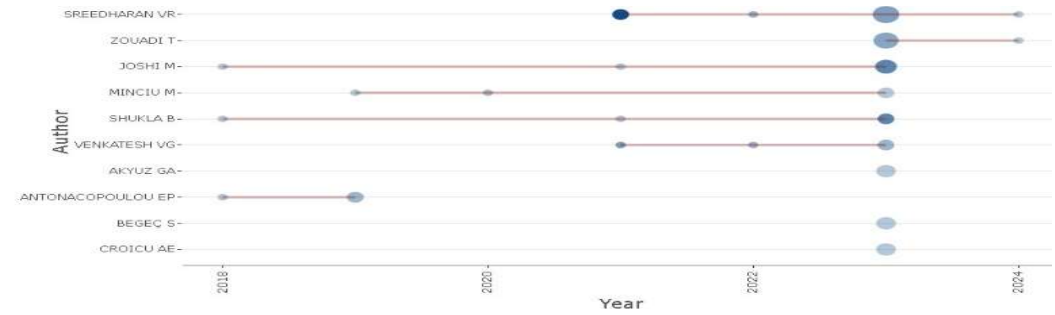

Figure 3. Authors' Production Over Time

When we look at the publication production of the authors who work most on VUCA over the years, it can be seen that Joshi made his first studies in 2018. It is also possible to say that Shukla has been working regularly in this field since 2018. Recently, it can be said that the work of Sreedharan and Zouadi has intensified.

Figure 4 below shows the most relevant affiliations.

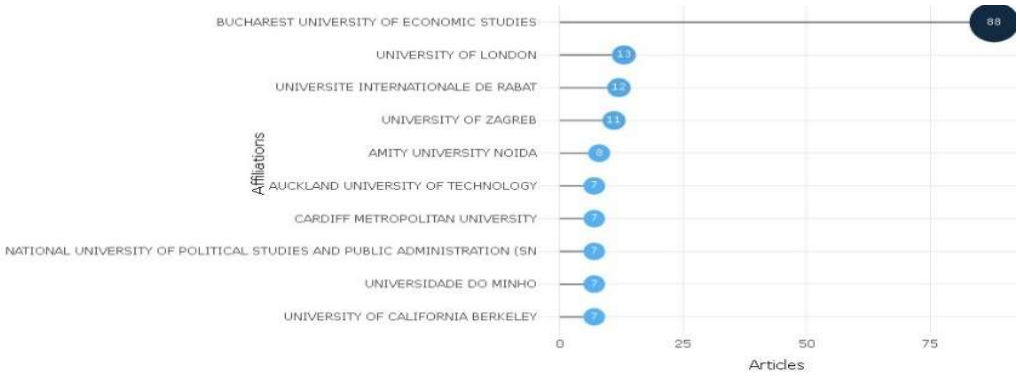

Figure 4. Most Relevant Affiliations

When the universities that show the most interest in research on the VUCA concept are examined, Bucharest University of Economic Studies comes first, University of London comes second, and Universite Internationale De Rabat comes third.

The countries of researchers who focus on VUCA research are shown on the map in Figure 5. The colors on the map represent the number of articles by researchers in the countries. It is understood that the number of articles published decreases as the color goes from dark blue to light blue. In the gray colored countries, there are no articles scanned in the WoS database.

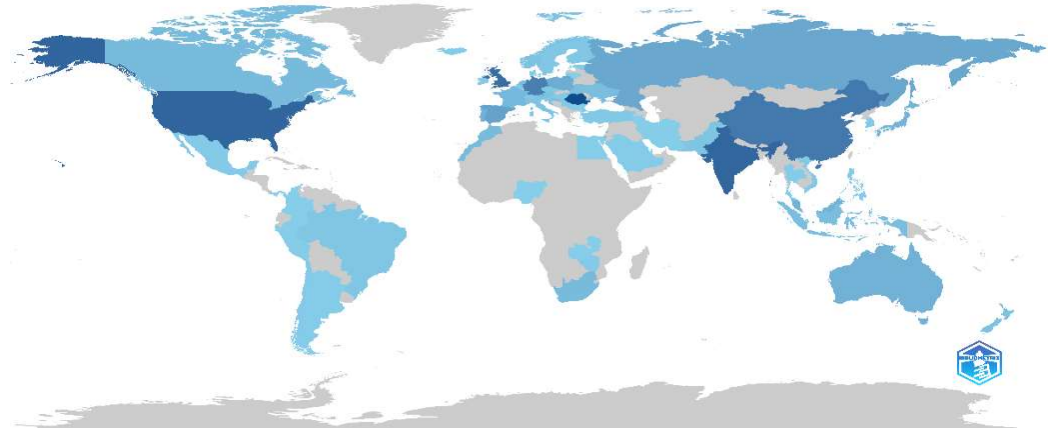

Figure 5. Countries' Scientific Production

When the quantitative data part of the map is examined, Romania with 138 articles, USA with 110 articles and India with 108 articles are in the first three places. On the map, it can be seen that there is a lot of gray area in most of the African continent and the inner parts of Asia. It can be interpreted that the number of articles published on the VUCA concept in these areas is limited or indexed in a different database. Figure 6 shows the countries and collaboration rates of the corresponding authors in the articles.

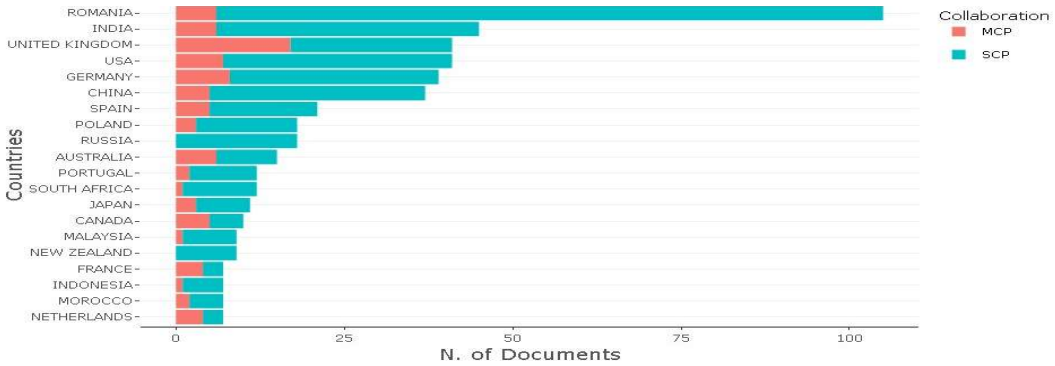

Figure 6. Corresponding Authors' Countries

It was determined that 156 of the 610 studies on VUCA in the WoS database were single studies. In this case, it can be stated that writers are more inclined to work collaboratively than to work alone. The section called SCP (Single Country Publications) in Figure 6 shows the number of publications made by researchers in the same country, and the section called MCP (Multiple Country Publications) shows the publications made by researchers in more than one country.

Table 2. Countries of Corresponding Authors, Number of Articles and SCP-MCP Rates

COUNTRY	ARTICLES	SCP	MCP	MCP%
ROMANIA	105	99	6	5,7
INDIA	45	39	6	13,3
UNITED KINGDOM	41	24	17	41,5
USA	41	34	7	17,1
GERMANY	39	31	8	20,5
CHINA	37	32	5	13,5
SPAIN	21	16	5	23,8
POLAND	18	15	3	16,7
AUSTRALIA	15	9	6	40,0
PORTUGAL	12	10	2	16,7
SOUTH AFRICA	12	11	1	8,3
JAPAN	11	8	3	27,3
CANADA	10	5	5	50,0
MALAYSIA	9	8	1	11,1
FRANCE	7	3	4	57,1
INDONESIA	7	6	1	14,3
MOROCCO	7	5	2	28,6
NETHERLANDS	7	3	4	57,1
AUSTRIA	6	5	1	16,7
ITALY	6	2	4	66,7
UKRAINE	6	5	1	16,7
FINLAND	5	3	2	40,0

When Table 2 is examined, Romania (SCP:99, MCP:6) with a total of 105 articles, India (SCP:39, MCP:6) with 45 articles and the United Kingdom (SCP:24, MCP:17) with 41 articles are in the first three places. can be seen. According to Table 2, although Finland ranks last in the number of articles, it has a very high rate in MCP. Italy ranks 20th among 22 countries in terms of productivity, but stands out as the country with the highest MCP rate (66.7).

Figure 7 presents an analysis of the thematic evolution in VUCA research literature based on author keywords. An examination of the thematic evolution of the VUCA field

provides an interesting broad picture of the development of the field. Such longitudinal analyses allow for highlighting how topics merge or split into several themes.

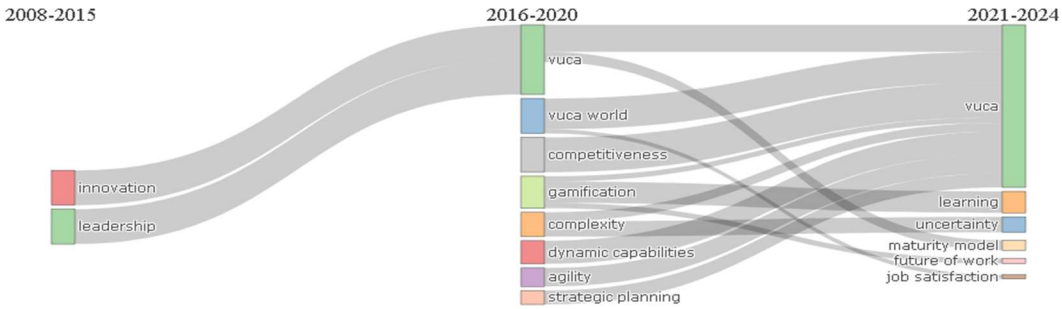

Figure 7. Thematic Evolution

Figure 4 presents an alluvial diagram, which can be described as a type of flow diagram. This type of graph is useful for visualizing the thematic evolution of a research field. The figure shows the thematic evolution of the VUCA research field in the period 2008–2024, by dividing it into three time slices or subperiods. Accordingly, we are looking at the evolution of keywords during three different time periods (2008–2015; 2015–2020; 2021–2024).

In the first phase (2008–2015), innovation and leadership are the dominant themes, which can be explained by the fact that this is the embryonic phase where studies were attempting to define and explain the concept. During the second phase (2016–2020), it is clear that research on the concept splits up into several themes, and studies on VUCA relate to concepts such as competitiveness, gamification, complexity, dynamic capability, agility and strategic planning. In the third phase (206–2024), we see the emergence of additional themes such as learning, uncertainty, future of work and job satisfaction.

Figure 8 shows the word cloud for the keywords used in articles about VUCA. Word cloud, one of the text mining methods, shows the most used words in a text or paragraph. The keyword in the center shows the most used word specific to the subject area. The size of the words indicates the frequency of use of keywords in research conducted on the subject area. A smaller word size means that that word is used less.

Figure 8. Word Cloud

When Figure 8 is examined, the most used keywords are; It is seen that there are VUCA, leadership, Vuca World, Covid 19, innovation, uncertainty, complexity, sustainability and digital transformation. A thematic map allows for visualizing important themes in a research field. Based on author keywords, we constructed a thematic map (Figure 9). This analysis generates clusters of keywords and identifies the themes in the research field. The map has two dimensions: centrality (x-axis) and density (y-axis). Centrality refers to how important a particular theme is, while density refers to

the development of the theme. The 2 × 2 matrix in the thematic map yields four quadrants, where the size of the bubble refers to the occurrence of the keywords (Madsen et al., 2023).

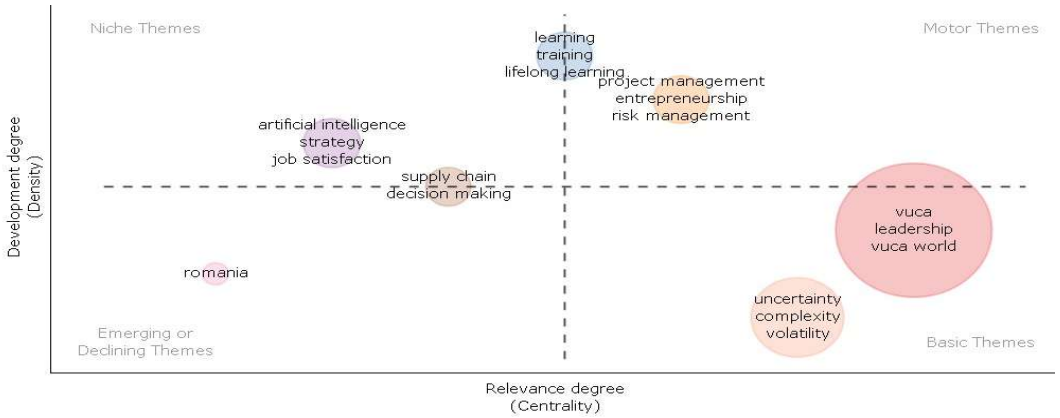

Figure 9. Thematic Map

In the upper right quadrant, we find the motor themes that are the most discussed topics in the field. The map shows that these are related to Project management, entrepreneurship and risk management.

The upper left quadrant contains the niche themes, which are well-developed but isolated (niche) themes. There are many niche themes in the VUCA literature, which could reflect that the concept currently is applied to many diverse areas such as research on artificial intelligence, strategy, job satisfaction and supply chain.

In the lower left quadrant, we find the emerging or declining themes. There are few themes in this quadrant and only one that is solidly within the quadrant ("Romania").

In the lower right quadrant, we find the themes that are considered basic and transversal, with low levels of development but high levels of centrality and relevancy to the VUCA literature. As can be seen from the map, most of the themes can be considered basic, including for key components of VUCA.

5. Conclusion

This article provides a bibliometric analysis of the VUCA concept. This analysis is based on a sampling of 610 studies published in journals indexed in SCI-EXPANDED, SSCI, A&HCI, CPCIS, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI. The dynamics of research on this concept grow chronologically. According to the results of the research, it was determined that the oldest article in the database was published in 2008. Geographically, the most productive region is the United States (in terms of number of documents and MCP rate). According to the findings, the thematic evolution of the VUCA research field in the period 2008–2024, by dividing it into three time slices or subperiods. For example, in the second phase (2016–2020), it is clear that research on the concept splits up into several themes, and studies on VUCA relate to concepts such as competitiveness, gamification, complexity, dynamic capability, agility and strategic planning. It has been determined that the researchers who published the most articles in the subject area are Sreedharan VR, Zouadi T. and Joshi M. When the scientific productivity of the countries was examined, it was concluded that Romania, India and the United Kingdom showed more productivity than other countries. When the universities that show the most interest in research on the VUCA concept are examined, Bucharest University of Economic Studies comes first, University of London comes second, and Universite Internationale De Rabat comes third.

In this research, R and R Studio programs were used for statistical analysis. R Studio program works compatible with the WoS database. WoS was preferred as the database in this research. Research in other databases can also be examined. Additionally, different

bibliometric analysis research can be carried out by using programs such as CiteSpace and Vosviewer.

There are very few bibliometric analysis studies on VUCA in the literature. The study has some similarities and differences with these few studies in the literature. For example, Erer (2024) stated in her study that the most productive country was the USA. However, in our study, the most productive country was determined to be Romania. At the same time, the countries in the second and third places were determined to be the same in both studies. The study offers a wide range of trends or concentrations in terms of scientific fields, countries and thematic areas. Our results may facilitate the planning, design, conduct, and publication of future research on this topic. This study was limited because it only addressed the concept of VUCA. Extending future studies to include the elements that make up the VUCA concept will enable the results to be expanded. Finally, it is expected that this study will make significant contributions to the literature on VUCA.

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Conflict of Interest: None.

Funding: None.

Ethical Approval: None.

Author Contributions: Fatih İbrahim KURŞUNMADEN (100%)

Çıkar Çatışması: Yoktur.

Finansal Destek: Yoktur.

Etik Onay: Yoktur.

Yazar Katkısı: Fatih İbrahim KURŞUNMADEN (%100)