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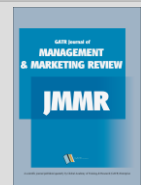
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## VUCA: A Bibliometric Analysis of published literatures using R

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### ABSTRACT

**Objective** - This study presents a bibliometric analysis on the publications of VUCA research from Scopus database for an unspecified period. However, it has been determined that VUCA only emerges in Scopus publications starting from 2012.

**Methodology/Technique** - A Bibliometric analysis using R-Studio software was performed using the Scopus database as at March 2021. Based on keywords used, which is related to VUCA in the article title, the study retrieved 108 documents and after one document was excluded due to relevancy issues, only 107 documents were further analysed using various tools.

**Findings** – Emerging concerns such as leadership and management in COVID-19 and post-COVID-19 could be interesting study topics to pursue in the coming years. Overall, due to the scarcity of publications on this topic, the prospects to publish in this area are plentiful. This topic's publication has only emerged since 2012.

**Novelty** - The publication trend has been on the rise since 2019 and is projected to continue if the COVID-19 pandemic is considered one of the most pressing challenges in the VUCA field of study. This provided future researchers with many opportunities to publish in SCOPUS on a recent VUCA topic. Issues of leadership and management in the new COVID-19 Pandemic standards could be a fascinating subject to explore in terms of publication possibilities.

**Type of Paper:** Empirical

**JEL Classification:** M10, M14

**Keywords:** VUCA; Volatility; Uncertainty; Complexity; Ambiguity; Bibliometric; R; Management

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### 1. Introduction

The US Army invented the term VUCA to describe the unfavorable circumstances that followed the end of the Cold War (Bennis, 1987). The term VUCA was coined by the US Army, but it has since gone beyond the military and into the commercial world. When the Twin Towers in New York were attacked on September 11, 2001, this concept gained even more traction as a description of a new type of warfare that was unpredictable, chaotic, and aggressive (Kaivo-oja & Lauraeus, 2018). The VUCA model was eventually embraced by corporate leaders around the world to deal with a variety of tough situations caused by a variety of external causes. Leaders, executives, and employees use the term 'VUCA' interchangeably.

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VUCA refers to the environment as it is and as it grows (Mack, & Khare, 2016). VUCA is a way of talking about change and the need to adapt to it. Peter Drucker, one of the founding fathers of modern management, spoke on the need for businesses to always be aware of and prepared for emergent developments that need rapid changes. Sticking to what is already known and how things have traditionally been done will not suffice in a VUCA world. We must develop new concepts, processes, and tools to stay ahead of the curve in the future. VUCA (volatility, uncertainty, complexity, and ambiguity) is an acronym that defines an environment that is volatile, unpredictable, complicated, and ambiguous. Volatility refers to a relatively unstable state of transition. Volatility is the turbulence generated by ever-increasing change and the rate at which it occurs. In other terms, it is unpredictably variable and erratic. Volatility is the element of the VUCA acronym that most closely resembles the old industrial meaning. Uncertainty is defined as a lack of clarity regarding whether an event will have substantial effects, as well as a lack of information with important significance for a certain environment. These elements set the tone for how businesses perceive their current and future situations. They identify parameters for planning and policy management. VUCA creates an environment that is suitable to controlling and leading. VUCA stands for "uncertain customer," "dynamic financial system and sector," "political complexity," "global and regional economic conditions," "competitor tactics," "market segmentation," "unsustainable advantages," "technological changes," and "innovations," all of which managers and employees deal with on a daily basis. Leaders and managers must develop new skills and talents to flourish in the VUCA environment. Most leaders and managers are overwhelmed by today's hazy, playful, contradicting, and complicated realities. Companies all over the world have been influenced by incremental globalisation, networked operations, and disruptive phenomena such as shifting demand, labor costs, or commodity prices, as well as other causes such as natural calamities. Many of these barriers, according to Bennett and Lemoine (2014), have become increasingly common in recent years, making business conditions much more onerous. As a result, Volatility, Uncertainty, Complexity, and Ambiguity are all present in the universe, and it is critical for leaders and organisations all over the world to think outside the box to stay on top of the current scenario, with each component posing its own set of obstacles. The acronym VUCA stands for "volatile, uncertain, complex, and uncertain," and it is a metaphor for today's leadership.

The most difficult aspect of managing and comprehending VUCA in businesses is not only the constant change, but also a complete knowledge of VUCA as a business and leadership concept. To avoid erroneous diagnoses that affected corporate efficiency, Bennett and Lemoine (2014) propose that executives convey a clear grasp of what each aspect of volatility, uncertainty, complexity, and ambiguity meant. The use of synonyms for the terms instability, perplexity, difficulty, and ambiguity resulted in costly errors. As a result of misreading environmental cues, businesses have spent money on the wrong remedies (Bennett & Lemoine, 2014).

The ability to forecast, feel, and react to change is one of the success elements in a VUCA workplace, which means that leaders must be willing to adapt to changing situations and discover winning conditions in flexible and creative ways. Every organization must be prepared to deal with a VUCA circumstance, which can occur at any time and without our knowledge. If a company or organization is unable to cope with VUCA, they will almost certainly suffer significant losses (Gruwez, 2017). VUCA learning is critical in this situation. One of the most important aspects of VUCA is that humans must learn to deal with new situations, such as following technological trends such as learning to code. The bibliometric analysis method, also known as scientometrics, is an element of the research evaluation methodology that permits the implementation of bibliometric analysis using its own methodologies from a variety of widely generated literature (Ellegaard & Wallin, 2015). The bibliometric method is a statistical strategy to measuring the literature that incorporates the application of quantitative analysis (Thomson Reuters, 2008).

Given that citations reflect the influence of research that has been done, research employing bibliometric methodologies can disclose that there are very few research outputs that are not cited after several years, the results show that these publications have functioned (Pritchard, 1969) used the word "bibliometrics" to describe the application of mathematical and statistical methods to books and other forms of communication. In the

same year, Alimov and Mul'chenko (1971) coined the word "scientometrics," which described science as a quantitative application concerned with the analysis of science as a process of information. There is a distinction between bibliometrics and science in that bibliometrics is concerned with more broad information processes such as books, papers, and other materials, whereas science is concerned with knowledge that is limited to the measurement of science communication. The British Standard Institution defines bibliometrics as the determination of mathematical and statistical methods using documents and patterns of a publication (Basuki, 2002).

## **2. Materials and Methods**

### **2.1 Data Source and Search Strategy**

A Bibliometrics analysis using R-Studio software was performed using the Scopus database as of March 2021. Bibliometrics analysis was used because it can be further extended to provide support in recognizing trends (Ball & Tunger, 2006). This research uses R because it is a language for statistical computing that follows a classical bibliometric workflow (Aria & Cuccurullo, 2017). The researchers used the search term 'VUCA' contained only in the title of the article. The term was used to search for relevant articles published related to research on VUCA. The researcher focused on the title of the articles because it is the first element that will attract the readers to the article (Annesley, 2010). The publishing year was not refined to a specific period due to the research's intention to observe the overall literature pattern for the theme. After going through all of the articles, the researcher has omitted one article due to relevancy issues.

### **2.2 Information Extraction**

Our research methodology strategy is illustrated in Figure 1. The researchers have omitted one article which is irrelevant to the topic. All the documents were subjected to Bibliometrics analysis. The researchers used (i) R-Studio software to calculate the citation metrics; (ii) Microsoft Excel 2013 to calculate the frequencies and percentage of the published materials and to generate relevant charts, tables, and graphs; and (iii) VOSviewer (version 1.6.16) to generate and visualize the bibliometrics networks (Antonacopoulou & Taylor, 2019; Antonacopoulou, 2014; Bellis, 2012; Warren & Nanus, 1985; Johansen, 2013; Lawrence, 1997; Bibliometric & Guallar, 2019; Rodriguez & Rodriguez, 2015; Zakaria, Ahmi, Ahmad & Othman, 2021).

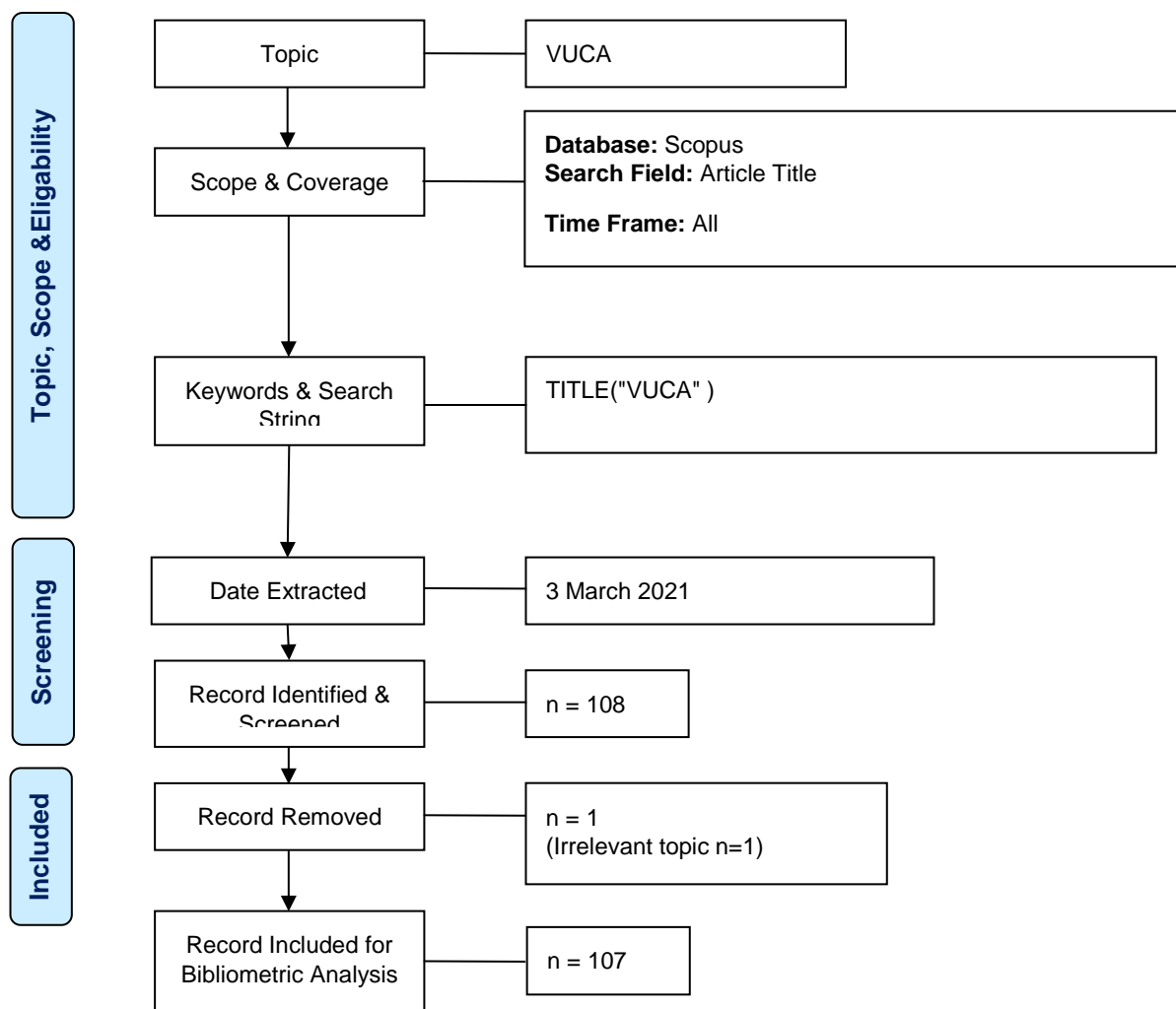


Figure 1. Flow diagram of the search strategy  
 Source: (Zakaria, Ahmi, Ahmad, & Othman, 2021)

### 3. Analysis and Results

#### 3.1 Descriptive Analysis

##### 3.1.1 Main Information

Table 1 summarizes all the main information regarding the articles related to this search query. A total of 108 documents were extracted from the Scopus database based on the document type and source type. One article was omitted from the calculation because the title is irrelevant to the research. The document types consist of articles, book, book chapter, conference paper, editorial, erratum, letter, note, review, and short survey. Even though the researcher has set an open time frame for journal extraction process, VUCA has only emerged on publication in Scopus database since 2012. Original articles accounted for 48.5% of the total document published followed by book chapter and conference paper at 18.7% and 12.1% respectively. Review articles comprise of 6.5%, review note 5.6%, short survey and book 1.86% each, and other document types that each contributed less than 1% of the total publication. The average year from publication is 3.49 years

while the average citation per documents is 5.28. The documents were cited on average 0.8558 per year. The total references for all the documents are 3094.

The most often seen keywords connected to the search query were VUCA world, leadership, and uncertainty, according to the VOSviewer software. In Figure 2, there are 35 primary keywords that are divided into five clusters, each of which is represented by a distinct color. Cluster 1 is highlighted in red and includes eight terms, including adviser, crisis, crisis leader, crisis leader advisor, disaster management, incident command system, meta-leadership, and NIMS (National Incident Management System). Cluster 2 is highlighted in green and contains eight keywords, including ambiguous, COVID-19, disruption, engineering education, pandemic, unsure, and vuca (volatile). Cluster 3, on the other hand, is represented by eight keywords: competences, foresight, higher education, innovation, leadership development, management development, strategy, and vuca world (shown in blue). Ambiguity, complexity, leadership, strategic management, uncertainty, and volatility are among the keywords in the fourth cluster (light green). The last cluster (purple) is made up of five keywords: creativity, curiosity, development, risk management, and VUCA.

<b>Description</b>	<b>Results</b>
<b>MAIN INFORMATION ABOUT DATA</b>	
Timespan	2012:2021
Sources (Journals, Books, etc)	80
Documents	107
Average years from publication	3.49
Average citations per documents	5.28
Average citations per year per doc	0.8558
References	3094
<b>DOCUMENT TYPES</b>	
article	52
book	2
book chapter	20
conference paper	13
editorial	3
erratum	1
letter	1
note	6
review	7
short survey	2
<b>AUTHORS</b>	
Authors	212
Author Appearances	256
Authors of single-authored documents	33
Authors of multi-authored documents	179
<b>AUTHORS COLLABORATION</b>	
Single-authored documents	36
Documents per Author	0.505
Authors per Document	1.98
Co-Authors per Documents	2.39
Collaboration Index	2.52

Table 1. Main Information Regarding Articles

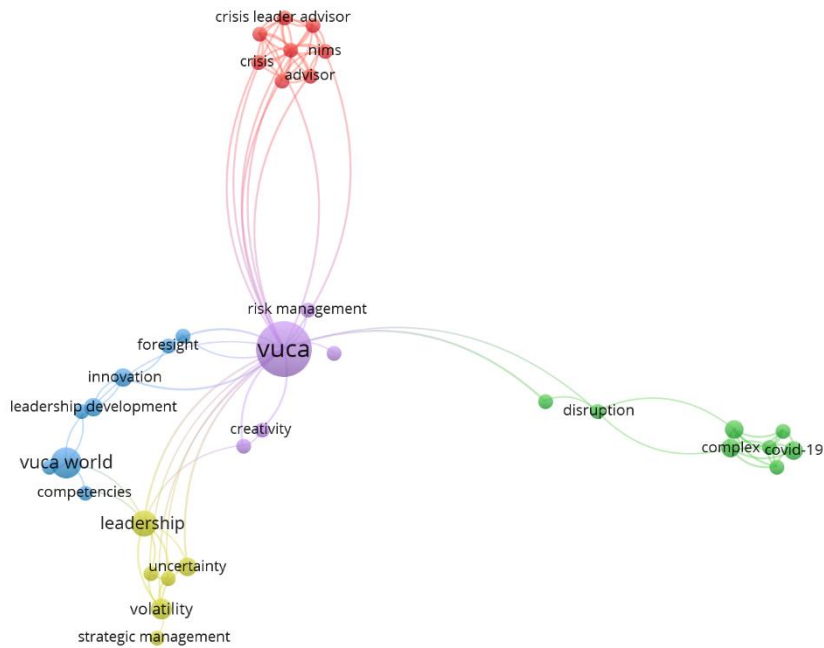


Figure 2. Network visualization map of the author keywords

### 3.1.2 Growth of Publications

From 2012 through March 2021, Figure 3 depicts the annual publishing trends of all publications. Except for 2019 and 2020, where the publication trends are static at 24 papers each year, the publication trends have been dynamic for the past 10 years. From 2012 to 2015, the number of documents published increased from one in 2012 to five in 2013. In 2014, 7 documents were published under the heading VUCA, while in 2015, 15 documents were published. In 2016, however, the number of publications fell to eight. Up until March of 2021, two documents have been published on this topic. In 2019 and 2020, the highest levels of productivity were recorded.

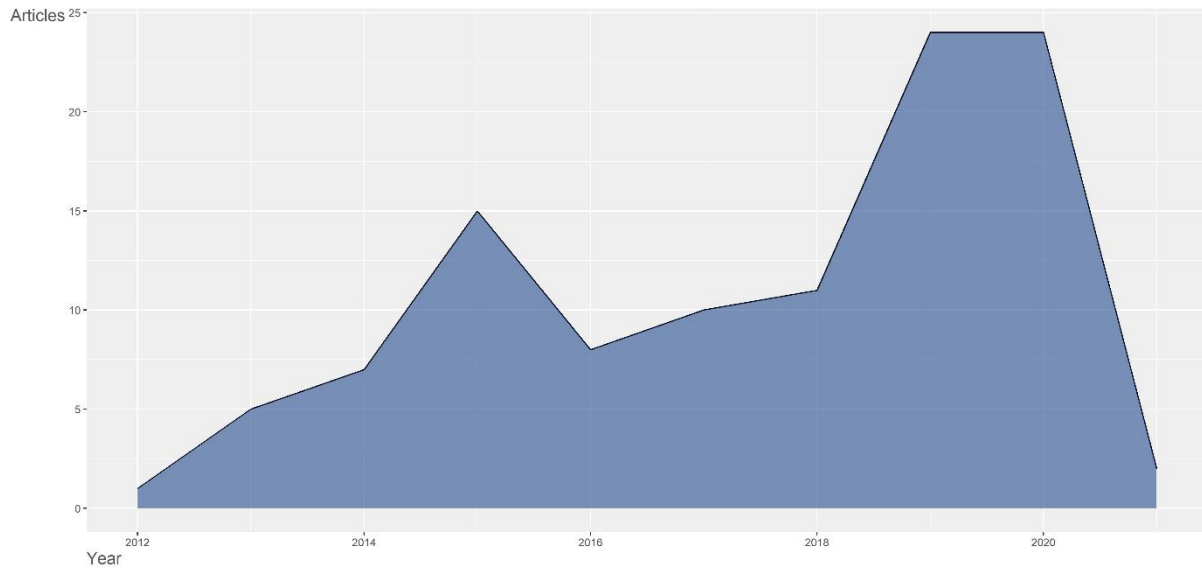


Figure 3. Annual publication trends

### 3.1.3 Authorship and Productivity

There is a total of 212 authors. A total of 36 (33.6%) documents were single-authored publications while remaining documents (66.4%) were multi-authored publications. On average, each author published 0.505 documents, and there are 1.98 authors per document while there are 2.39 co-authors per document. On the other hand, the collaboration index is 2.52.

The most productive author is Khare with 5 publications. The remaining top 9 authors are AlkhadliKh, Austin MI, Cura Ba, Dantzer, Holland, Mack, Maples, and Marcus Li with 3 publications each as illustrated in Figure 4. Authors with a minimum number of publications of 2 documents and a minimum total citation of 2 were visualized using VOSviewer software and are presented in Figure 5. The network visualization map includes eight circles, each representing one author. Some of the names might not be seen due to overlap of names. Closed circles showed active authors of close research alliances. Figure 6 shows the network visualization map of co-citation analysis for authors with a minimum citation of 10. Bennet, N., received the highest number (33) of connecting lines from other authors indicating that this author was being co-cited with most other authors. As listed in Table 2, the most relevant source of affiliations for the authors is Harvard, Tan School of Public Health (12) followed by Athabasca University (7).



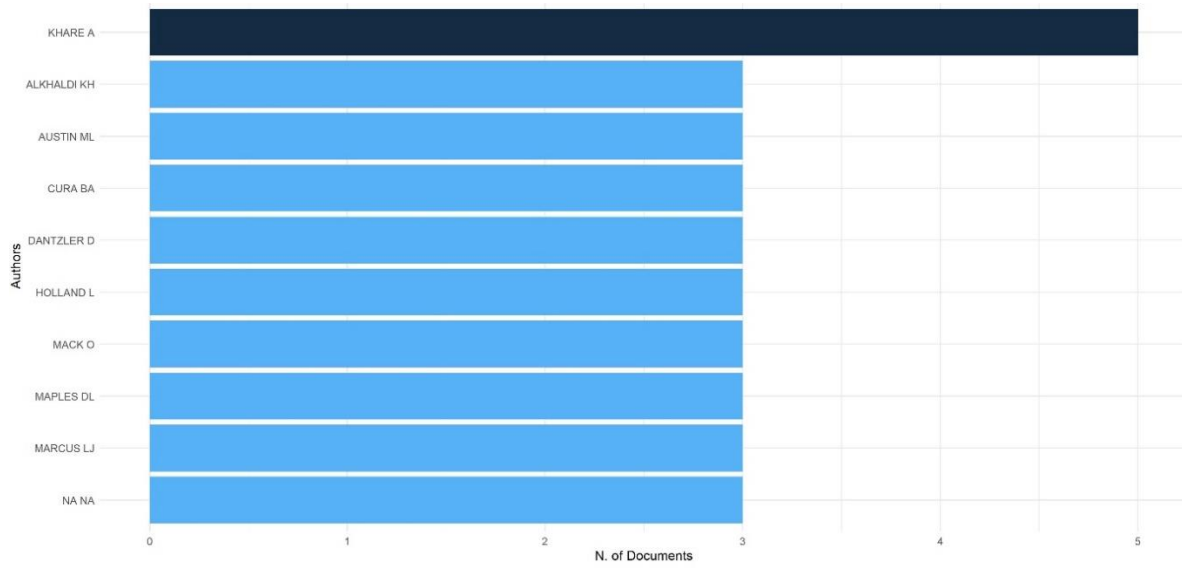


Figure 4. Most cited authors

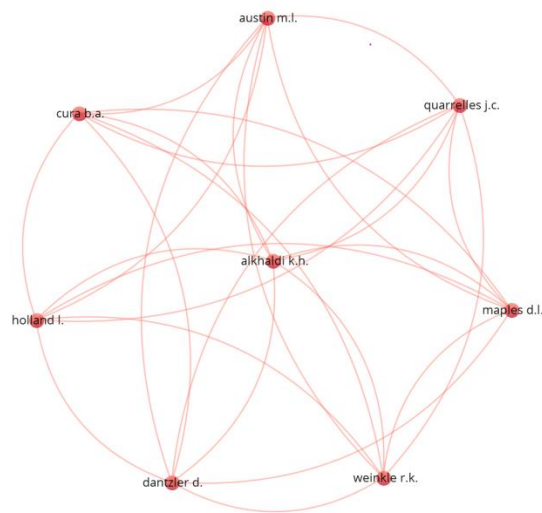


Figure 5. Network visualization map of co-authorship in VUCA research

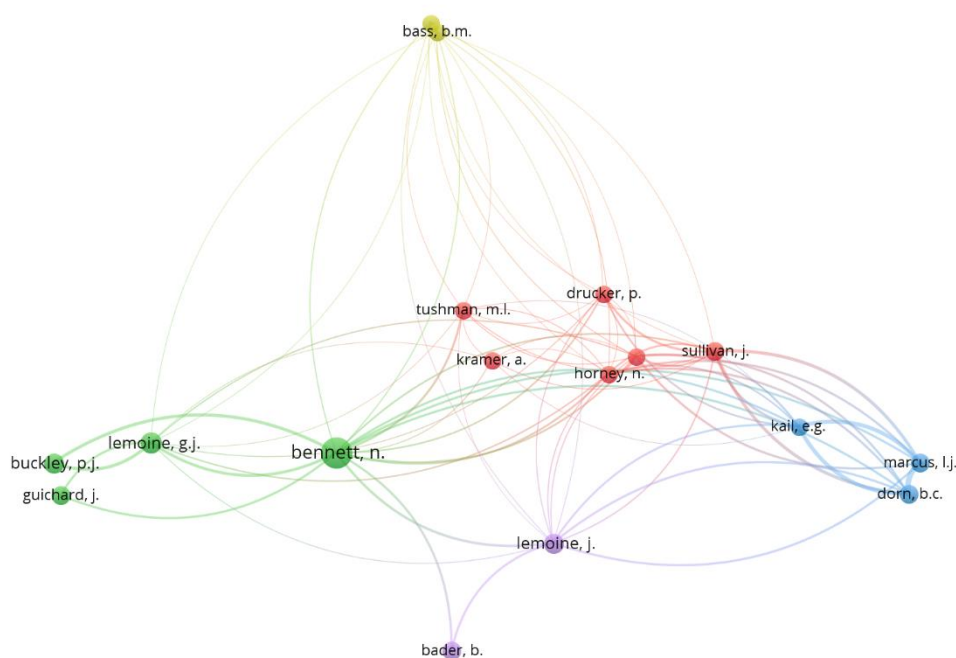


Figure 6. Network visualization of co-citation

Descriptions	Frequency
<b>Most productive affiliations</b>	
Harvard T. H. Tan School of Public Health	12
Athabasca University	7
Business and Information Technology School	3
Center for Disease Control and Prevention	3
Kharkiv National Automobile and Highway University	3
University of Johannesburg	3
Bucharest University of Economic Studies	2
EvangelischeTehologischeFacultiet	2
Harvard University	2
Hult International Business School	2

Table 2. Source of author’s affiliation

### 3.1.4 Geographical distribution of publications

The top 10 countries that contributed to the publications are listed in Figure 7. India ranked first with a total of 7 (6.5%) documents followed by Germany (5.6%) and both Austria and United States of America (3.7% each). Figure 8 illustrates the visualization of collaboration among countries with minimum productivity of 5 documents. The visualization map shows 5 countries distributed in two different clusters, each with different colors. The largest cluster (in red) is comprised of United States of America, India and Germany while the second cluster (in green) is represented by Canada and United Kingdom.

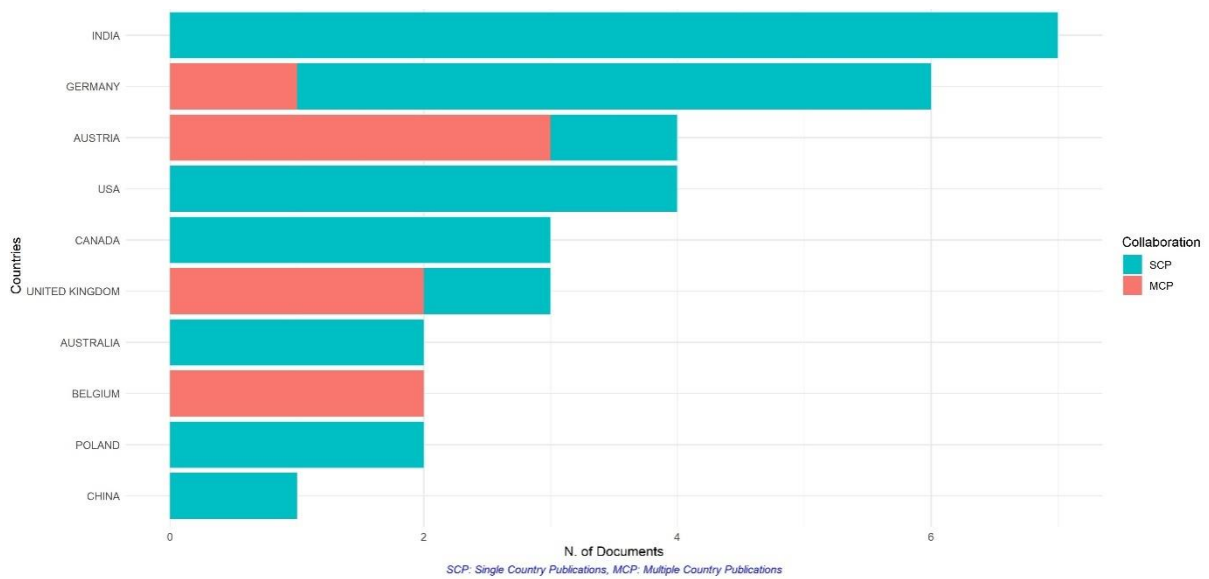


Figure 7: Top 10 countries contributed to the publications

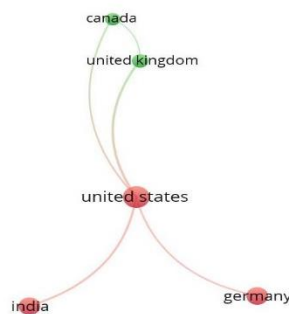


Figure 8. Network visualization map of international collaboration among countries with minimum productivity of 5 documents.

### 3.1.5 Preferred Journals and Frequently Used Keywords

Table 3 lists the top 10 publications on VUCA research. Managing in VUCA World ranked first with 12 documents followed by the International Journal of Advanced Science and Technology (4) while Contributions to management Science and Progress in International Business Research each published 4 documents on the topic. Other publications such as Development and Learning in Organizations, Economic Annals-XXI, Foresight, Fortune, Journal of Critical Reviews, and Journal of Emergency Management each published 2 articles. Table 4 list the top 10 most used keywords in their documents. Leadership (12) ranks first followed

by human (9), disaster planning (8), humans (7). Keywords such as male, female, qualitative research and uncertainty appears 6 time each, while keywords such as adult and decision making appears twice in each.

<b>Descriptions</b>	<b>Frequency</b>
<b>Most preferred publications</b>	
Managing in a VUCA World	12
International Journal of Advanced Science and Technology	4
Contributions to Management Science	3
Progress in International Business Research	3
Development and Learning in Organizations	2
Economic Annals-XXI	2
Foresight	2
Fortune	2
Journal of Critical Reviews	2
Journal of Emergency Management	2

Table 3. Most preferred publications

<b>Descriptions</b>	<b>Frequency</b>
<b>Most relevant keywords</b>	
Leadership	12
Human	9
Disaster planning	8
humans	7
female	6
male	6
qualitative research	6
uncertainty	6
adult	4
decision making	4

Table 4. Most relevant keywords

#### 4. Discussion

There have been no bibliometric studies on VUCA research to far. Despite the fact that VUCA has been known since the late 1980s, there are only 107 publications in SCOPUS up until March 2021. This topic's publication has just been on the scene since 2012. The publication trend has been on the rise since 2019 and is projected to continue if the COVID-19 pandemic is considered one of the most pressing challenges in the VUCA field of study. This provided future researchers with many opportunities to publish in SCOPUS on a recent VUCA topic. Leadership and management issues in the new COVID-19 Pandemic standards could be a fascinating subject to explore.

This research has a few limitations. To begin with, the information offered is confined to the Scopus database of publications. If this analysis adds other databases like WoS, PubMed, and Google Scholar, the data will be richer. Each database can be used to conduct a bibliometric analysis comparison research. Second, the data under consideration was current until March 2021, and new research is published every day. Third, the citation count simply reflects the frequency of occurrences and not the publication's quality.

## 5. Conclusions

The country that contributed the most to VUCA research was India, followed by Germany. The key publication relating to VUCA research remained Managing in a VUCA World. Due to his large number of publications in this topic, Khare is likely to be an excellent candidate for collaborative study in this field. Emerging concerns such as leadership and management in COVID-10 and post-COVID-19 could be interesting study topics to pursue in the coming years. Overall, due to the scarcity of publications on this topic, the prospects to publish in this area are plentiful.

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