Human Resources in the Volatility, Uncertainty, Complexity, and Ambiguity (VUCA) Era: A Bibliometric Analysis

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Abstract

The aim of this study is to conduct a Bibliometric analysis of scientific studies on "VUCA" in the fields of business and management for the period: 2014–2024. In this context, data were obtained from the Web of Science (WoS) database, and the VOS viewer program was used for the analysis. The results showed that it was determined that there were 209 studies on the concept of VUCA, and it was found that 135 of these studies were in the management, business and environmental sciences category. The findings of the analysis indicate that the highest number of studies on VUCA was conducted in the management category (64), and the most studied document type was the article (94.815%). According to the results of the analysis, which revealed that the interest in the subject had been increasing, especially after 2017, the most cited author was "V. Raja Sreedharan"; the most productive country was the Peoples R China and the most used keywords were "performance" and "VUCA". It is believed that the findings obtained from this study will provide insights into the studies to be conducted on the subject and contribute to the research areas that are growing in the field of VUCA and the topics that will be the focus of research activities in the near future.

1. Introduction

The greatest obstacle facing the current generation is the corona virus disease (COVID-19) pandemic. Businesses have been severely affected, so it is difficult to say when things return to normal. Words such as corona virus and VUCA were not widely used in the past. The term "corona virus" was once only used in scholarly or medical contexts, but the public has now come to understand it due to personal experiences with its devastating effects. Undoubtedly, COVID-19 has made the world a VUCA environment. Most academicians and executives refer to this; many sources claim that executives and academics commonly refer to this complex environment by the acronym "VUCA'. It is a military acronym; VUCA is increasingly being used to characterize chaotic commercial environments **(Bennett & Lemoine, 2014).** Due to continuous change in customers and staff because of various global financial, economic and technological changes take place and it's become very difficult to keep an eye on them. The consequences of such simultaneous occurrences are intricate and wide-ranging **(Margolis & Turner, 2012).** Above given various things happen consecutively because of that unsystematic form taking place. Consequently, VUCA has a greater influence on business life than on other spheres of existence. It is also one of the topics emphasized by the scientific community and has drawn attention.

With Bibliometric analysis, the particular circumstances of such a vast field can be disclosed. Motive of this study gives detailed information about the given topic in the research field by showing Bibliometric analysis and it's based on the top ten research categories contribution in the Web of science database (WoS). Starting this research study provides the basic understanding about the research topic. Next, a Bibliometric analysis of papers published in WoS on pertinent field subjects was carried out. Implications of the research outcomes identified through its ability to enable researchers to track a subject's developmental path.

2. Conceptual Framework

The United States of America Army first used the term 'chaotic and

dangerous environments' during the 1990s to forecast the next move of other parties because of the rising challenges and threats during the cold war. Due to the good result of VUCA it was not only useful for the army but it was started and used in various sectors such as educational, financial, political and also in the NPO **(Wolf, 2007).** Due to the financial crises in the business field this term gained more approval **(Tovar, 2016).** This term became very typical in the corporate sector so that it cannot be ignored **(Sullivan, 2013).** 'VUCA' term gained more popularity because of the rise of the global economy due to interconnection of various firms**(Humphries-Kil & Jamil, 2017).**Crux of the term "VUCA" state the effectively and efficiently performance of a business organisation in a dynamic and challenging environment.

(I) Volatility- According to Bennett and **Lemoine (2014),** this describes comparatively unstable and occasionally surprising development. Examples of this concept include shifts in policy and consumer preferences, renewable energy, price fluctuations, lifestyle changes, and commodity pricing. According to **Sinha and Sinha (2020),** volatility term is not only associated with a single factor which affects the business but it involves all the factors which affect business organisation directly or indirectly.

(II) Uncertainty-Is defined as a lack of particular information, a high probability of surprise, and low predictability **(Schick et al., 2017).** Large, 'dramatic' changes often occur in uncertain situations **(Sullivan, 2012).** The US terrorist strikes of 2001 are among the best examples of this element. There was a great deal of uncertainty in the world following these incidents regarding where, when, and the possibility of future attacks **(Bennett & Lemoine, 2014).** What may happen in future and not any regulation over the loss which can affect business all these are the natures of uncertainty **(Rzemieniak & Nowacka, 2022).**

(III) Complexity-Describe complexity in business structure, instability in business environment and non-association of different parts of a business unit **(Schick et al., 2017).**Complexity can be also defined as the large component and unrelatedness in among these **(Ko and Rea, 2016).** The entire ecology is impacted when any one of these elements or variables changes **(Akdemir et al. 2021).** There is some information available or predictable regarding the nature of complexity. For instance,

there is no unpredictability in the complicated laws, rules, and cultural expectations that a business must deal with when conducting business in another nation **(Kosuri & Raghuramapatruni, 2017).**

(IV) Ambiguity- Refers there is no clarity and understanding about the various conditions of a business unit **(Chakraborty, 2019).**Under the ambiguous environment it becomes very difficult to identify the problem there causes and solutions **(Sullivan, 2012).** As per **Cooke (2013),** it breeds mistrust, hinders decision making, poses a threat, and results in lost opportunities. Increased ambiguity is mostly caused by demographic shifts, technological disruption, global rivalry and new work values.

Separate consideration of VUCA components is not always troublesome However, sudden spikes in any one of the four VUCA components simultaneously could make this a dangerous scenario **(Prensky, 2014).** Bob Johansen introduced the "VUCA PRIME" strategy in 2007 to guard against the dangers of the VUCA world and take use of its potential. Within this framework the techniques of clarity versus complexity, comprehension versus ambiguity, vision versus vitality and agility versus ambiguity have been suggested within this framework **(Lawrence, 2013).**

3. Method
Bibliometric analysis of the 'VUCA' is the main base of this study which includes the top ten contributing groups on the WoS database. Findings of the study shown by visual mapping features of the VOS viewer because of its advantages, including finding the most significant scientific publications and sources, reviewing recent advancements in research, and evaluating outcomes by creating an academic foundation, Bibliometric analysis adds to the body of literature **(Martinez et al., 2015).** It serves as an objective standard and is used to assess the calibre and effectiveness of science **(Ekᵒi et al., 2022).**

Bibliometric analysis is a quantitative study of the database related to a specific topic which has already been done already and it provides in-depth knowledge about the future in that particular domain **(Kurutkan & Orhan, 2018).** Because Bibliometric analysis offers an infrastructure that can support thorough evaluations and reduce researcher errors, it was selected for this study **(Donthu et al. 2021).** Scopus, Web of

Science and various other databases facilitate the Bibliometric analysis as per requirement. The most popular databases for Bibliometric analysis are WoS, Scopus, Google Scholar, PubMed, and MEDLINE **(Cobo et al., 2015; Chen, 2017).**Web of Science is a very good database which comprises various research related documents and facilitate sufficient resource for study so that it was used in the study **(Martinez et al., 2015).** Furthermore, according to **Brito-Ochoa et al. (2020),** this database offers basic metadata, including abstracts, references, impact factor of the journal, indicators of high-impact quality, different institutions, citations count, list of the authors and different nations.

Within the study parameters, data were extracted on August 26, 2024, using the keyword "VUCA" from the WoS database. 209 publications were selected using the relevant word from the WoS database as the "topic" in the initial stage. Subsequently, inclusion and exclusion criteria were used in this study. Data extracted for the research study was based on top ten discipline "Management, Business, Environmental Sciences, Environmental Studies, Green Sustainable Science Technology, Psychology Multidisciplinary, Engineering Industrial, Education Educational Research, Psychology Applied and Engineering Manufacturing" and the document types to "articles, Early access, Editorial Material, Review Article, Book Chapters, Meeting Abstract, Proceeding Paper and Retracted Publication. Data extracted for Bibliometric analysis through implementing inclusion and exclusion criteria of the study only allowed for the inclusion of studies from 2014 to 2024(reason behind the choosing this time frame was that study in this field initially started from 2013). VOS viewer (version 1.6.20) software was used to show the data gathered in the second stage. Various types of network data are created through VOS viewer and it helps in visualising, exploring and creating the map **(Van Eck & Waltman, 2020).** VOS viewer was chosen for this study because it provides the finest quality of graphic display of the research.

4. Findings

In this study firstly output of literature and then map and network visualisation shown as the findings of the study. Through the Table :1 it is found that most of the documents were in the category of Articles and then Early access, Editorial Materials, Review Article, Book chapters, Meeting Abstract, Proceeding Paper and Retracted publications.

Table 1: Different Types of Documents According to Publications

Different types of documents	Overall record	% of 135
Article	128	94.815
Early Access	13	9.63
Editorial Material	3	2.222
Review Article	3	2.222
Book Chapters	1	0.741
Meeting Abstract	1	0.741
Proceeding Paper	1	0.741
Retracted Publication	1	0.741

In the given below Fig 1 different categories of documents in the field of 'VUCA' are shown by number of publications and citations. In the given figure publication started from 2014 and it is increasing from 2017 after that in 2023 highest publication can be seen. In 2024 no. of publication cannot be exactly decided because we are still in the mid of the year.
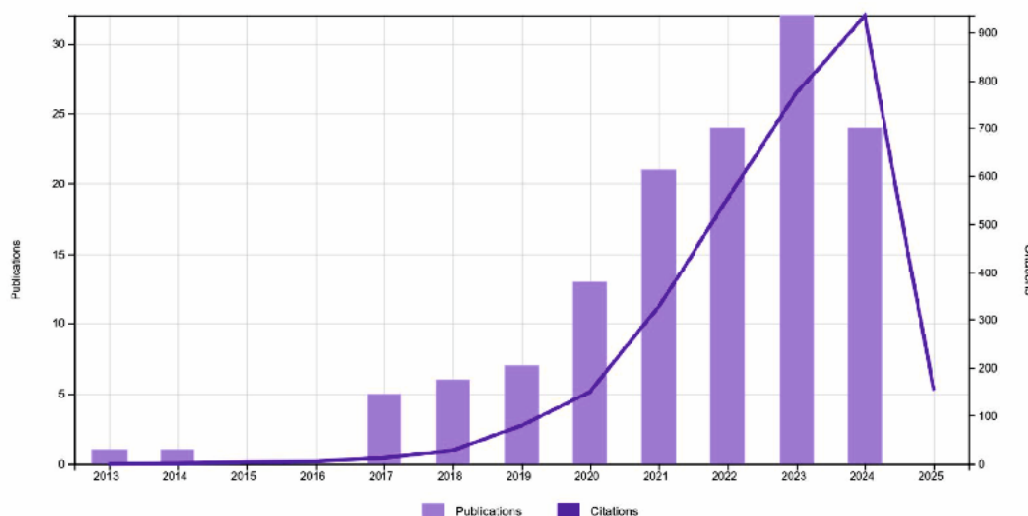
Figure 1: Citations and publications in different years

Source: WoS

Different authors publications and citations given in Table: 2 Given below table 2 show the various authors publications and their total citations in which we found that author named **Bennett and Lemoine (2014)** was the most cited author with total no of publications 403.

Table 2: Total Citations of Different Authors

Titles	Authors	Publications Year	Total Citation
What a difference a word makes: Understanding threats to performance in a VUCA world	Bennett, Nathan; Lemoine, G. James	2014	403
Innovation, Dynamic Capabilities, and Leadership	Schoemaker, Paul J. H.; Heaton, Shovi; Teece, David	2018	311
How can SMEs successfully navigate VUCA environment: The role of agility in the digital transformation era	Troise, Ciro; Corvello, Vincenzo; Ghobadian, Abby; O'Regan, Nichlas	2022	182
Rethinking teacher education in a VUCA world: student teachers' social-emotional competencies during the Covid-19 crisis	Hader, Linor L.; Ergas, Oren; Alpert, Bracha; Ariav, Tamar	2020	118
Management Innovation in a VUCA World: Challenges and Recommendations	Millar, Carla C. J. M.; Groth, Olaf; Mahon, John F.	2018	118
Entrepreneurial team and strategic agility: A conceptual framework and research agenda	Xing, Yijun; Liu, Yipeng; Boojihawon (Roshan), Dev K.; Tarba, Shlomo	2020	77
Developing a blockchain framework for the automotive supply chain: A systematic review	Reddy, Kotha Raj Kumar; Gunasekaran, Angappa; Kalpana, P.; Sreedharan, V. Raja; Kumar, S. Arvind	2021	67
Managing VUCA: The human dynamics of agility	Baran, Benjamin E.; Woznyj, Haley M.	2021	61
Management Innovation Made in China: Haier's Rendanheyi	Frynas, Jedrzej George; Mol, Michael J.; Mellahi, Kamel	2018	61
Disruptive innovation and dynamic capabilities in emerging economies: Evidence from the Indian automotive sector	Pandit, Deepak; Joshi, Maheshkumar P.; Sahay, Arun; Gupta, Rajen K.	2018	59

On the basis of obtained data in Fig.2 we found the most productive top ten countries publications wise were as PEOPLES R CHINA 29(21.481%), USA 26 (19.259%), ENGLAND 21 (15.556%), AUSTRALIA 12(8.889%), and India 10 (7.407%) made up the top five places.

Figure 2: Most productive countries publication wise
Source: WoS

The Web of Science database is used for the collection of data to complete the study and Vos viewer was used to present the data in a diagrammatic way. In this study findings were presented in the form of Co-authorship, Co-occurrences and co-citations of the documents.

4.1. Analysis of Co-Authorship

Collaboration of authors on a specific manuscript and a very significant author is shown through the Co-authorship analysis **(Zupic & Cater, 2015).** If authors 'relationship is increasing then it will cause an increase in the network connections among the authors. Overall, 399 authors were found during co-authorship analysis which evaluated the degree of affiliation between the authors who have done most collaborative work together it was based on the top ten field of research categories (Business, management, environmental studies, environmental sciences green sustainable science technology, engineering, industrial psychology multidisciplinary, psychology applied & engineering manufacturing). Only "15" authors, however, satisfied the predetermined threshold value when the authors' total number of publications and citations was set to "2."
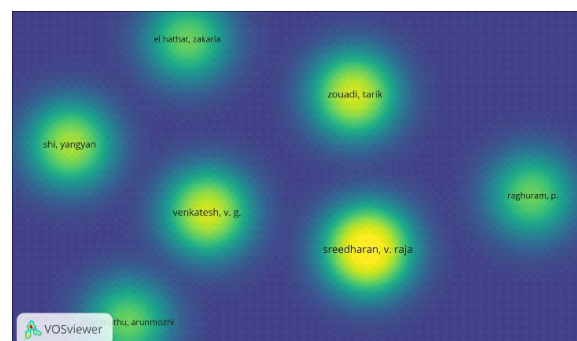

Figure 3: Co-Author Network Image

Source: VOS viewer

According to the citation and publication most influential authors were Tarik Zouadi and V. Raja Sreedharan, as seen by the density map in Fig. 3. As a result, there is a strong bond amongst these writers.

4.2. Analysis of the Co-occurrence

In order to find out the term used with a combination of VUCA keyword analysis was conducted. A total of 135 papers contained 945 terms. The analysis was conducted by establishing the requirement that every keyword appear in at least "3" different research. Following investigation, it was found that "91" words satisfied the criteria.

Figure 4: Keyword Network Map

Source: VOS viewer

Six distinct clusters comprise the most frequently used keywords in VUCA, as depicted in Fig. 4. It was found that the following terms made up the first cluster: artificial intelligence, business, companies, complexity, decision making, firms, framework, future, implementation, information, logistics, models, optimization, project management, resilience, strategy, sustainability, supply chain management; second, burnout; third, China, COVID-19; creativity; second, dynamic environment; third, engagement; fourth, identification; model; motivation; fifth, outcomes; sixth, personality; seventh, quality; eighth, self; agility, context, antecedents, ambidexterity, employee engagement, digital transformation, and human-resource management, job-satisfaction, meta-analysis, perspective, strategic agility, technology, work engagement fourth cluster capabilities, collaboration, commitment, digitalization, impact, instrumental leadership, leadership, mediating role, moderating

role, requirements, teams, transactional leadership fifth cluster absorptive-capacity, big data analytics, block chain, challenges, competitive advantage, firm performance, industry, knowledge, management, organizational resilience, VUCA world sixth cluster dynamic capabilities, dynamic capability, education entrepreneurship, firm, higher education, firm, innovation, organizations, products. Below given table 3 most often used topmost ten keywords are given.

Table 3: Most Used Keywords

Keyword	Overall link strength of the given words
Performance	203
'VUCA'	174
innovation	135
impact	78
mediating role	76
leadership	71
capabilities	63
moderating role	61
dynamic capabilities	60
management	58

4.3. A Co-citation Analysis

To fix the relationship among various publications, co-citation analysis was conducted **(Zan, 2019).** Reaching to most significant publications and finding topic clusters are two advantages of the analysis **(Donthu, 2021).**

4.3.1 Cited References

In order to create the network map of co-cited references, the minimum number of citations was set to "4". It was found that "43" out of 8709 references satisfied the threshold value.
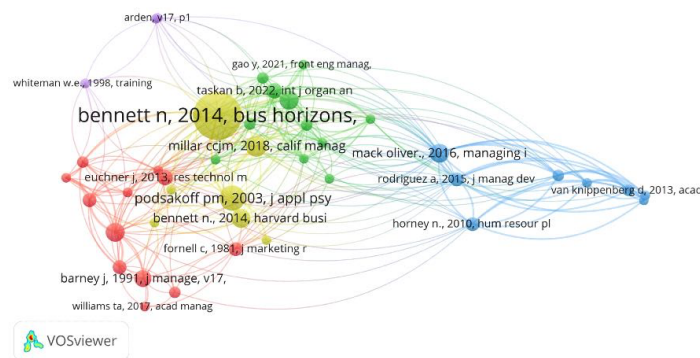
Figure 5: Commonly cited references network image
Source: VOS viewer

According to the reference-based co-citation analysis mapping, Bennett and Bus Horizons' (2014) work has received the greatest citations. Mack Oliver is one of the other often mentioned references (2016).

4.3.2. Cited Sources

Through setting a minimum number of citation '7' network map of co-cited reference & sources was created. Only '203' from 3925 references fulfilled the decided criteria.
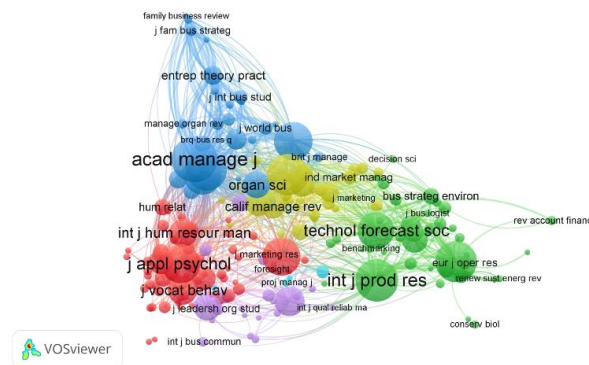

Figure 6: Commonly cited sources network image
Source: VOS viewer

The most often referenced sources are, as Fig. 6 illustrates, the Academy of management journal, international journal of production and business research, Journal of management, Journal of clean production etc.

4.3.3. Cited Authors

Minimum number of citations '5' entered to create the network of co-cited authors. After setting the given threshold limit only '121' from 6974 writers fulfil the conditions.
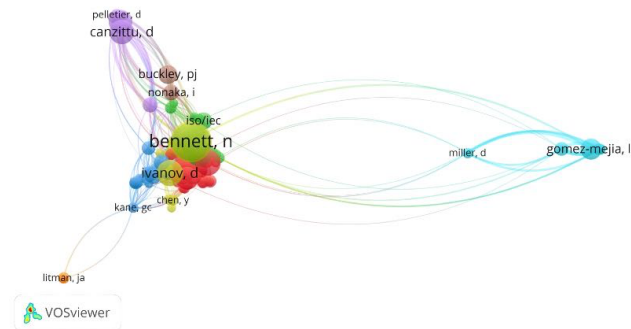
Figure 7: Co-cited authors network image

Source: VOS viewer

As per Fig.7 most cited authors are Canzittu D., Guichard, J and Gomez- Mezia, Lr.

5. Conclusion

Descriptive viewpoints offered in top ten contributors in various disciplines such as: environmental studies, environmental sciences, green sustainable science technology, business, management, psychology multidisciplinary, engineering industrial, psychology applied, and engineering manufacturing, since its goal is to monitor the growth of VUCA in different fields. Bibliometric analysis of the 135 papers published from 2014 to 2024 was done using the VOS viewer. Bibliometric analysis used to understand the available huge unstructured data related to VUCA. Based on the results, one could claim that the fact that most studies on VUCA fall under the article category suggests that this is a topic that academicians have looked into and are interested in. There should be more document kinds (early access, editorial material, review article, book chapter, book chapters, meeting abstract, proceeding paper, and retracted publication), as seen by the limited number of document types other than articles. Still, this is not something to be concerned about. Since only four studies on VUCA (all categories) were completed until 2014, it can be claimed that the notion is relatively new. Studies on VUCA (all categories) initially started in 2008.

Publication on the VUCA was irregular in spite of the fact that it followed an increasing trend. Nonetheless, the COVID-19 epidemic in 2022 is believed to be one of the primary causes of the fact that the majority of research on the topic was carried out in 2023. Because of the increased complexity and uncertainty brought about by the lack of

knowledge about the disease and the abrupt shifts in its trajectory during the pandemic, ambiguous environments were created. As a result, it made sense that interest in VUCA would rise. Furthermore, the subject's interest and fashion ability are demonstrated by the notable gains in citations over time.

The most often cited article on VUCA, as per the data collected from the WoS database published by **Bennett & Lemoine (2014)** in Business horizon journal, was "What a Difference a Word Makes: Understanding Threats to Performance in a VUCA World". After analysing the publishing distribution by nation, it becomes evident that the nations that prioritize education and development are the most productive ones: People's Republic of China, the United States, England, Australia, India, Morocco, Spain, Germany, France, and Wales. This finding suggests that there is a positive relationship between the nations with a huge number of publications and nations whose researchers made it possible for the VUCA concept to arise and flourish. Analyses of co-citations, co-authorship and co-occurrence have been shown by network mapping diagrams. By showing numerical data that was acquired as a result of the analysis, this offered a greater possibility for evaluation.

It is anticipated that this study will serve as a guide for those wishing to investigate VUCA and add to the body of literature. Researchers who wish to work on this topic can use this study to plan their research and gain an understanding of the pertinent literature. However, the study is not without its drawbacks. Within the parameters of the study, the data set is the first obvious constraint. Within the WoS categories, the 135 publications that were assessed for this study came from studies in the following categories: "Management, Business, Environmental Sciences, Environmental Studies, Green Sustainable Science Technology, Psychology Multidisciplinary, Engineering Industrial, Psychology Applied, and Engineering Manufacturing. Due to assessment of all types of publication together without any categorisation it will give a broader and multidisciplinary perspective for future research. Study analysis is restricted to the papers included in the WoS Core Collection, which is another constraint. But Bibliometric analysis is also applicable to databases like PubMed, EBSCOHost, Google Scholar, SCOPUS, and others. Furthermore, in subsequent investigations, scholars may utilize several other visual mapping applications.

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