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Bibliometric Analysis of Trends in Theory-related VUCA Publications

Nazaruddin Malik

Department of Management Studies, Universitas Muhammadiyah Malang, Malang, Indonesia

nazaruddinumm01@gmail.com

Abstract. This study aims to determine the results of the research development on Volatility, Uncertainty, Complexity and Ambiguity (VUCA) based on the Scopus database analysed in 2012-2022 with Bibliometric analysis with VOSViewer. The research theme Innovation and Leadership had the highest attention with a percentage of 16%.. Next showed that there were seven main themes that focused on four major themes: leadership, leaders, management, and environment, with the correlation and connectedness of the results of the Cluster Analysis based on the Coefficient value.

Keywords. Bibliometric analysis, VUCA, VOS viewer, leadership and organization

1. Introduction

The world system has a complex development and undergoes rapid changes among its sub-systems in creating fluctuating environmental stresses [1], [2] .The increasing globalization and development of technological, social, economic and political, as well as environmental advancement creates an increasingly volatile, uncertain, complex, and ambiguous (VUCA) business and organizational environment [3], [4]. Business and organizational environments face multiple demands regarding exploration and exploitation, especially in a competitive environment [5]. This condition is a domino effect that is not only caused by the COVID-19 factor, but also the impact of technological developments such as Artificial Intelligent and renewable energy systems that add to the complexity of society. Furthermore, the environment describes the context of the practice of predicting the future, related to the transition from the world of SPOD to the world of VUCA [6], [7], [8].

The 21st century organizations face a complex and competitive environment called the "threshold of chaos" which is largely led by globalization and the technological revolution [9], [10]. In a volatile, uncertain, complex, and ambiguous time in the business cycle, organizations are required to be agile to meet market demands aimed at aligning a dynamic environment [11]. These conditions create crisis events, major events, events or periods with many facets and phases, which affect individuals, groups and/or society. Crisis events and significant changes can have dramatic and widespread impacts at multiple levels [12]. In the last two decades, the

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business sector has faced the complexity of the supply chain, forcing companies to innovate competitively [13].

The volatile economic environment is characterized by challenges and changes, requiring organizations and companies to adapt systems to enhance their competitive capabilities [14], [15]. The business environment innovation strategy is an important part and a top priority in responding to VUCA conditions [16], (Robbins, 2018). The outcomes from this research include recognizing strategic inflection points and related businesses, and recognizing strategic perspectives in organizational life, and also understanding the sources of sustainable competitive advantage [17], [18]. Therefore, knowledge workers have to have the skills and comprehension of possible ways to navigate and adapt to constant change.

Responding to VUCA to the world's climate requires great care, creativity and collaboration, as well as a high willingness to cooperate [19], [20]. To ensure business sustainability and VUCA viability, organizations need proactive managers with strategic thinking competencies to forecast and plan beyond the current business scenario [21], [22]. Leadership in business and related issues was focused during the late 20th century due to the fierce and unruly business environment with high volatility and with intense, uncertain, complex and ambiguous competition (VUCA) [23]. Organizational culture informs its ability to change and its agility to respond quickly. A compelling story that makes the case for change internally and externally contributes to the success of change management and is critical for leaders to thrive and communicate effectively [24], [25], [26], [27].

There have been several studies responding to the condition of VUCA in the last two decades, with various systematic review approaches. A strategic approach to problem resolution in a complex and chaotic environment was carried out through communication transparency and data balance [28]. To deal with environmental disturbances, organizational focus has to be directed at learning by all stakeholders [29], with the characters of quick, proficient, and flexible response, often with communication practices described in High Reliability Organizations (HRO) which also face ongoing crisis events [28], [29]. This research focuses on developing a holistic approach to dynamic capabilities, in dealing with the VUCA crisis, so that it can produce recommendations for the response stages of organizational and business activities that are concrete in determining and implementing strategies to respond to VUCA based on previous research approaches.

2. Method

The data were generated from the Scopus database in June-July 2022 to identify literature on VUCA. The Scopus platform is one of the most extensive citation and abstract databases of peer-reviewed literature, such as: scientific journals, books, and conference proceedings [30]. The types of research documents collected in this study were only articles in the 2012-2022 timeframe. Then, in analysing and searching data, this research followed a standard five-stage scientific mapping workflow system: study design, data collection, data analysis, data visualization, and interpretation. By tracing previous research data, the initial stage was to identify publications related to research on VUCA topics in their titles, abstracts, or keywords: TITLE-ABS-KEY (vuca) AND PUBYEAR > 2011 AND PUBYEAR < 2023 AND (LIMIT-TO (DOCTYPE , "ar")) AND (LIMIT-TO (SUBJAREA , "BUSI") OR LIMIT-TO (SUBJAREA , "SOCI") OR LIMIT-TO (SUBJAREA , "ECON")) AND (LIMIT-TO (LANGUAGE , "English")) AND (LIMIT-TO (SRCTYPE , "j")).

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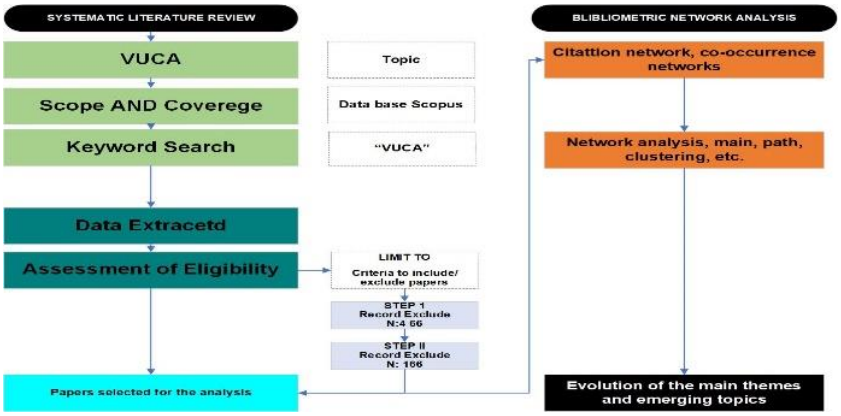
Figure 1. Stages of Data Collection and Analysis



These indicators were based on a bibliographic database, which was designed primarily for information retrieval purposes so that the study of information represented only a secondary use of the system. In fact, this was the main goal of all kinds of bibliometric exercises, to turn something intangible (scientific quality) into a manageable entity [31]. The methodological approach in the systematic review used inclusion and exclusion criteria assessment, to filter the number of irrelevant document articles in the CUVA study based on subject area, open access, type of article document and English language. Based on the results of the publication, articles that were appropriate and oriented to VUCA research in the focus sectors of study were Business, Management and Accounting (122), Social Sciences (65) and Economics, Econometrics, and Finance (27). Furthermore, prior to extraction, duplicate records were removed before the design of the data extraction template to extract relevant data capable of significantly informing the synthesis process [32].

In the bibliometric analysis stage, published articles were classified based on several identification variables. The article database was grouped based on the condition of the research discipline, highest publication, journal, and type of publication, comparison of countries, affiliations, authors, and identified research production patterns. Then, for the analysis of visualization of the network between results, as well as the theme of research findings between articles, VOS viewer software tool was executed to identify the literature network and recommendations for VUCA actions. The analysis was focused on the total link strength technique tools (link strength calculated based on full or fractional counting) and occurrence (the number of occurrences) [33].

3. Results and Discussion

Infographics and Distribution of VUCA Research Development Trends

The results of the search from the Scopus data for VUCA research in 2012-2022 had a total number of 163 research documents. VUCA research has an increasing trend every year in the period 2012-2022. The highest number of studies was conducted in 2020 and 2021 with post-COVID-19 events. The purpose of publication analysis was to enable precise comparisons between institutions and countries on a global scale, based on the intensity of the number of publications, leading research and synthesis between literature. Information on publication patterns can be used in the humanities and social sciences, where the spectrum of document types expected is larger than in medical research and therefore presents a significant problem

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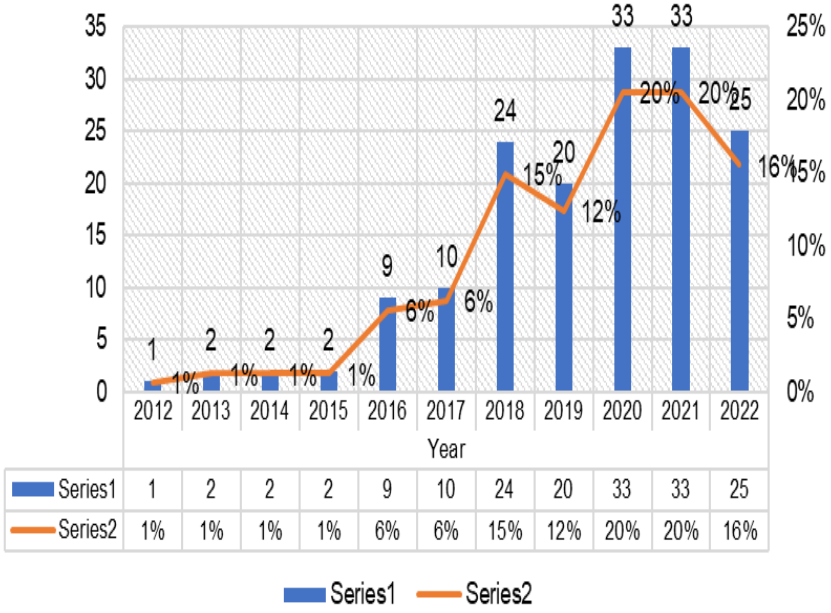
for citation analysis [34]. The foci of the VUCA research study in the distribution of development trends each year can be seen in Figure 2.

Figure 2. VUCA Research Trend



VUCA as a research base has a dominant concern that is influenced by the crisis occurring in the world. Research identification can be informatively explained based on the distribution of countries and affiliations in the highest article. The identification results showed that the United States has the highest number of studies with a total of 29 document articles with a percentage of 37%. Then the country of India ranks second with a total of 28 research documents (35%). The highest ranking in the number of VUCA research publications is in the three Australian countries, with a total of 22 article documents and a percentage of 28%. Overall, based on the results of the analysis of the distribution of VUCA research from 25 countries, only three countries have published articles with a total of more than 20 articles on Scopus. To find out the detailed infographics on the distribution of author trends and institutional affiliations in the three countries with the highest VUCA research publications, see Table 1.

Table 1. VUCA Research Infographic Presentation in the World

Countries	Total		Author	Total		Affiliation	Total	
United States	29	37%	Agogino, A.	1	6%	University of California, Berkeley	2	10%
			Bahrami, H.	1	6%	Pepperdine University	2	10%
			Beckman, S.L.	1	6%	Ashridge	1	5%
			Berger, A.	1	6%	University of California	1	5%
India	28	35%	Sharma, S.	2	11%	Panjab University	2	10%

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Countries	Total		Author		Total	Affiliation		Total
			Sharma, S.K.	2	6%	Nirma University	2	10%
			Aboobaker, N.	1	6%	Lovely Professional University	2	10%
			Aggarwal, A.	1	6%	ICFAI Business School	1	5%
Australia	22	28%	Antonacopoulou, E.P.	2	11%	Cranfield University	2	10%
			Moldjord, C.	2	11%	University of Reading	2	10%
			Steiro, T.J.	2	11%	Norges Teknisk-Naturvitenskapelige Universitet	2	10%
			Stokkeland, C.	2	11%	University of Birmingham	2	10%

Based on the identification of the data in Table 1, it was shown that there was no author and state dominance playing as the main actor in the development of the VUCA study. The highest ranks one to three did not have a large total number gap. In addition, the country that became the research base also had a distribution that was not dominated by one continent. This condition was seen as an important statement of the quality of comparative research on the results of review articles representing each country. However, there was a large gap shown by those under the one to three rankings. Furthermore, to show the results of the polarization visualization of the distribution of VUCA research developments in each country, the display is as follows.

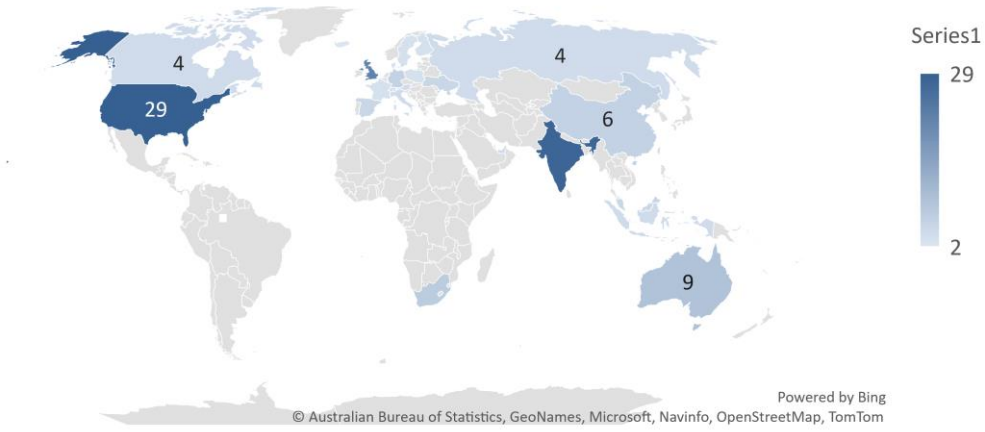

Figure 3. VUCA Research Trends by Country

VUCA Research Development Trends

The research focus of the VUCA study to date has been on addressing sustainability challenges and strategies. VUCA research developments can be classified based on keywords and research focus. The results of data analysis showed the main theme of the study, while keywords were dominated by the ten main themes above. The research theme Innovation and Leadership has the highest attention with a percentage of 16%. Then, research on the study of COVID-19 events has relatively high attention with a total of 12%. Keywords related to the

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focus of the VUCA study have a correlation with the challenges faced in responding to VUCA follow-up. The study of innovation and leadership plays an important role in the success of any organization whether it is a private or public entity, a fledgling or emerging company, or a for-profit or not-for-profit organization. Leaders are expected to lead their people in difficult times where volatility, uncertainty, complexity and ambiguity are seen as common norms [35].

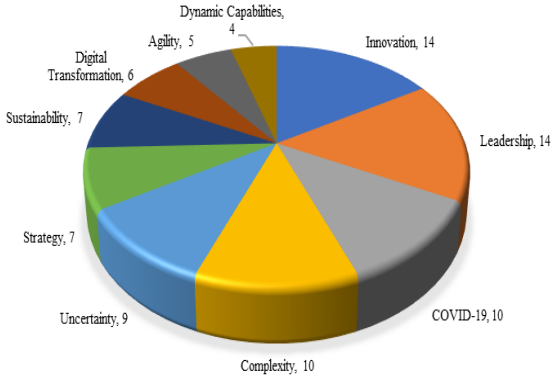

Figure 4. VUCA Study Area Focus Development Trends

Further identification of VUCA development trends was structured by identifying research results that were becoming the reference for each researcher. At this stage, the classification of good and highly cited articles was considered. Authors who have good research results can be categorized based on the highest citation results. The highest quotation can indicate the trend of development of the discussion of interest. The results of identifying the highest citation data have a correlation with the visualization analysis of the dominant theme of the VUCA research development trend. The research entitled Innovation, dynamic capabilities, and leadership, has the highest number of citations with 162 citations. The research was conducted by Schoemaker, P.J.H., Heaton, S., Teece, D. in 2018, which answered the challenges of leadership in the crisis era. Then the second research with the highest number of ciattion has the title of Management innovation in a VUCA world: Challenges and recommendations, which was conducted by Millar, C.C.J.M., Groth, O., Mahon, J.F. with a total of 74 citations in 2018.

Table 2. Journals Based on the Highest Number of Citations

Document titles	Authors	Year	Sources	Cited by
Innovation, dynamic capabilities, and leadership	Schoemaker, P.J.H., Heaton, S., Teece, D.	2018	California Management Review 61(1), pp. 15-42	162
Management innovation in a VUCA world: Challenges and recommendations	Millar, C.C.J.M., Groth, O., Mahon, J.F.	2018	California Management Review 61(1), pp. 5-14	74
Digital transformation during a lockdown	Fletcher, G., Griffiths, M.	2020	International Journal of Information Management 55,102185	67
Entrepreneurial team and strategic agility: A conceptual framework and research agenda	Xing, Y., Liu, Y., Boojihawon, D.K., Tarba, S.	2020	Human Resource Management Review 30(1),100696	44

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Document titles	Authors	Year	Sources	Cited by
Rethinking teacher education in a VUCA world: student teachers' social-emotional competencies during the Covid-19 crisis	Hadar, L.L., Ergas, O., Alpert, B., Ariav, T.	2020	European Journal of Teacher Education 43(4), pp. 573-586	42
Disruptive innovation and dynamic capabilities in emerging economies: Evidence from the Indian automotive sector	Pandit, D., Joshi, M.P., Sahay, A., Gupta, R.K.	2018	Technological Forecasting and Social Change 129, pp. 323-329	39
Metaphors for today's leadership: VUCA world, millennial and "Cloud Leaders"	Rodriguez, A., Rodriguez, Y.	2015	Journal of Management Development 34(7), pp. 854-866	38
Super-Flexibility in Practice: Insights from a Crisis	Evans, S., Bahrami, H.	2020	Global Journal of Flexible Systems Management 21(3), pp. 207-214	37
Design thinking: Organizational learning in VUCA environments	Cousins, B.	2018	Academy of Strategic Management Journal 17(2)	33
Business excellence in a volatile, uncertain, complex and ambiguous environment (BEVUCA)	Saleh, A., Watson, R.	2017	TQM Journal 29(5), pp. 705-724	31

Information on metadata research on VUCA development trends can be used as a recommendation for future research. These recommendations are related to the VUCA approach used to analyse the adaptability, innovation, stability, sustainability, and leadership of organizations in crisis and information technology developments.

Linkage and Clustering of Themes in VUCA

Data analysis and visualization in this section explains the concepts in several visualization results related to the research findings. The results of the visualization of the VOS viewer classified the results of the themes of previous research findings based on clusters. In the VUCA study for the period 2012-2022, there were five main clusters. Furthermore, colour grouping codification was used in each cluster to identify the dominant concept/theme of the findings. Classification and visualization network of VOS viewer was intended to show the distribution of dominant study theme, and to bring up good and interesting themes for future studies. The results of the visualization of the data analysis of previous studies using the VOS viewer in Figure 4 showed that each cluster had a different colour symbol.

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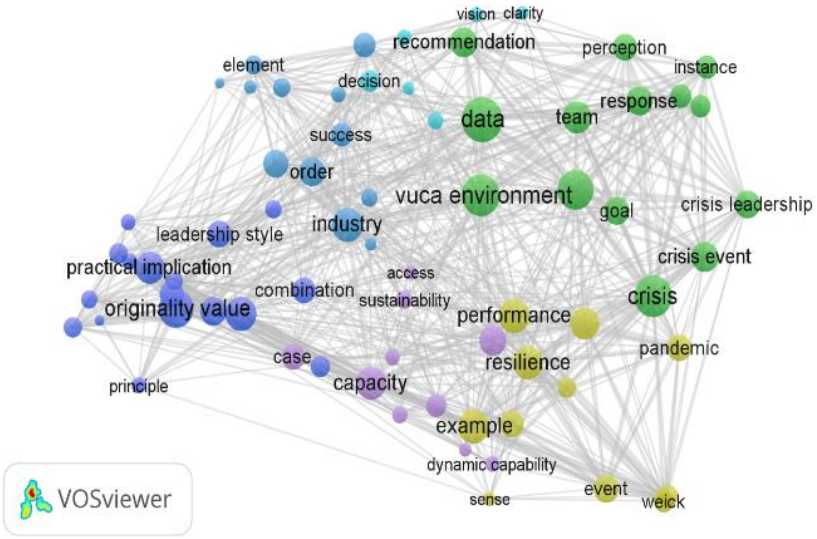
Figure 5. VUCA Research Theme Network



The identification in the form of a mapping in Figure 5 can help researchers, especially those who are just starting their research from scratch. In addition to visualizing the dominance of research density in a particular theme, this tool can also explain the correlation between the results of theme mapping based on article reviews. The green colour coding describes the scope of the VUCA Environment, which has the highest research with multiple studies. These conditions can be identified from the network correlation associated with several clusters. The main problem of the VUCA as a result of the research has a discussion related to crisis, leadership, data, goals, recommendations, and perception. This condition explains that VUCA has major problems caused by the crisis aspect and requires good goal recommendations.

Then the codification in blue, the main theme of Industry, has a network relationship with order, decision, success, element, vision, and clarity. This aspect focuses on the form of response within the industry in VUCA conditions by implementing the right strategy. Furthermore, the yellow colour codification discusses having the main theme focusing on performance which is related to research results on the themes of Weick, COVID, resilience, examples, and events. The focus of this research is on the impact and sustainability actions in dealing with VUCA. Overall, the results of the VUCA research themes have a strong relationship with the leadership crisis. VUCA conditions require leadership in any business the environment remains the same even in times of innovation, rapidly changing technology, high market competition, increasing demographic diversity, and many other factors. The classification of each VUCA research cluster from 2012-2022 is displayed in Table 3.

Table 3. Cluster Themes in VUCA

Cluster	Themes	Total	Percentage
Cluster I	Agility, awareness, combination, idea, individual, institution, leadership style, lesson, millennial, orientation, originality value, practical implication, principle, responsible leadership, social implication, workplace	16	26%

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Cluster II	Advisor, crisis, crisis event, crisis leadership, data, goal, instance, participant, perception, recommendation, response, system, team, VIUCA environment	14	23%
Cluster III	Competency, competitive advantage, component, element, industry, interaction, order, organisational culture, paradigm shift, power, success, word	12	19%
Cluster IV	COVID, event, pandemic, performance, resilience, sense, sense making, term. Test, weick	10	16%
Cluster V	Access, business leader, capacity, case, company, dynamic capability, effect, human resource management, organizational transform, sustainability	10	16%

The identification of each cluster of research results provides information on the scope of the study grouping that developed under VUCA conditions. Cluster-I focused on several aspects that business organizations need in responding to VUCA conditions. Cluster-II concerned with problems that occur as a result of VUCA conditions which have resulted in crisis problems in several sectors, one of which is leadership in the organization. Meanwhile, Cluster-III answered problems by focusing on competencies and aspects that needed to be trained in response to VUCA through improving organizational culture. Cluster-IV focused on the causes of external conditions for VUCA problems in the business and organizational space. Finally, Cluster-V was a study that observed the determinant aspects to generate strategies within the scope of business and organizations responding to collective action.

The Dominant Theme in VUCA

Upon the understanding of the classification and scope of VUCA's research developments, technical studies could be identified based on dominant themes. The analysis was carried out using the NVivoPlus12 software to show the identification and classification of VUCA research interests that were of concern in the world. The results of the review of research development trends from 166 Scopus articles were then processed using the crosstab tabulations tool. The results suggested that seven main themes were discussed in several general clusters. VUCA's research was based on addressing the challenges leaders need in responding to these conditions. The study of leadership problems had a scope that discussed wise leadership, virtuous leadership, style, transformational leadership, sustainable leadership, strong leadership, strategic leadership, responsible leadership, leadership style, leadership skills, and agile leadership. Furthermore, the nature of leadership could be achieved from the results of studies that discussed the theme of leaders and focused on agile leaders, efficient leaders, facing leaders today, formal leaders, great leaders, inclusive leaders, intelligent leaders, leader behaviour, leading design, leading innovation, leading millennial, leading organizations, responsible leaders, senior leaders, specific steps leaders and strategic leaders.

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Figure 6. VUCA Theme Domination Spread

Very few VUCA studies discussed leadership strategies and leadership styles in responding to conditions of the uncertainty and crisis. Attention outside the topic only pinpointed aspects such as forms of management action, business, change, crisis conditions, and the environment. The management aspect had the attention of the study to find strategies for managing people, senior portfolio managers, process management, data management, management responses, time management, manager works, top management teams, performance management, agile management, as well as human resource management. This condition is one of the research concerns to answer the technical needs of the business and organizational scope in using a new work culture. In the business scope, the studies include adaptive business pathways, business decision-making, business domains, business innovation, business model innovation, business transformation, daily business operations, global business environment, meaningful business creation, and unique business models. The above business actions can help the business sector to evaluate and respond to the vision for the future development of the industrial sector and companies. These main themes are crucial parts of responding to challenges and planning appropriate actions to create business, industry and organizational sustainability in VUCA conditions.

The Relationship between the Topics of VUCA

The results of the analysis and review of 166 research articles discussing VUCA using the NVivoPlus12 software have shown several main themes. VUCA's research focused on the following themes: leadership, leaders, management, and the environment. These themes have a correlation and connectedness from the results of the Cluster Analysis based on the Coefficient value. After finding the trend of research development based on density and dominance between main themes, detailed identification was carried out to show correlations between themes in a small scope. The results of the identification suggested that there were twenty comparisons of Coefficient values between themes, showing different values and colours. The systematic assessment was identified based on the comparison table of the results of the correlation coefficient values which were codified with colour. The correlation between the main themes has a correlation coefficient value above (0.6) (See Table 4).

Table 4. Comparison of Themes Based on Correlation Coefficient Value

Code A	Code B	Pearson correlation coefficient	Code A	Code B	Pearson correlation coefficient
leadership	change	0.790207	environment	business	0.655882
leadership	leaders	0.789391	leaders	crisis	0.655747
leaders	environment	0.778591	management	environment	0.652033
management	leaders	0.732798	leadership	business	0.620731
leadership	environment	0.722511	management	business	0.554811
change	business	0.719789	environment	crisis	0.531718
management	leadership	0.705914	leaders	business	0.486189
management	change	0.697498	management	crisis	0.403843
leaders	change	0.679609	leadership	crisis	0.227108
environment	change	0.668985	crisis	change	0.190743

The results of the analysis among themes indicated that there was a strong connection between the discussions. Leadership category in changing VUCA conditions had a high

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correlation value of 0.790207. In VUCA's global business environment, a benevolent approach to leadership is the key to organizational excellence [36].

The Mapping of The VUCA Themes

The discussion on the urgency of VUCA's current research has the aim of providing a solution for responding to the resilience strategy and sustainability of the business scope. Analysis and review of international articles discussing VUCA could be identified regarding the form and results of correlations between studies that recommended the conceptual framework flowchart model in Figure 7. Understanding the conceptual framework was performed through the early stages of the occurrence of VUCA's uncertainty and ambiguity conditions. The main factor influencing the condition of the occurrence of VUCA in the world was due to external aspects of the business environment, which resulted in crises in several sectors. The main external problems might include workspace environment, working environment, threat environment, regulatory environment, operating environments, local environment, dynamic environments, disruptive business environment, competitive environment, chaotic environments, and ambiguous environments. Uncertainty and the level of change in the external environment in the business sector resulted in high crisis conditions. Then, in this study, a follow-up formulation framework during the VUCA period in the scope of the business sector can be described in Figure 7 as follows.

Figure 7. Conceptual model of business organization in response to VUCA.

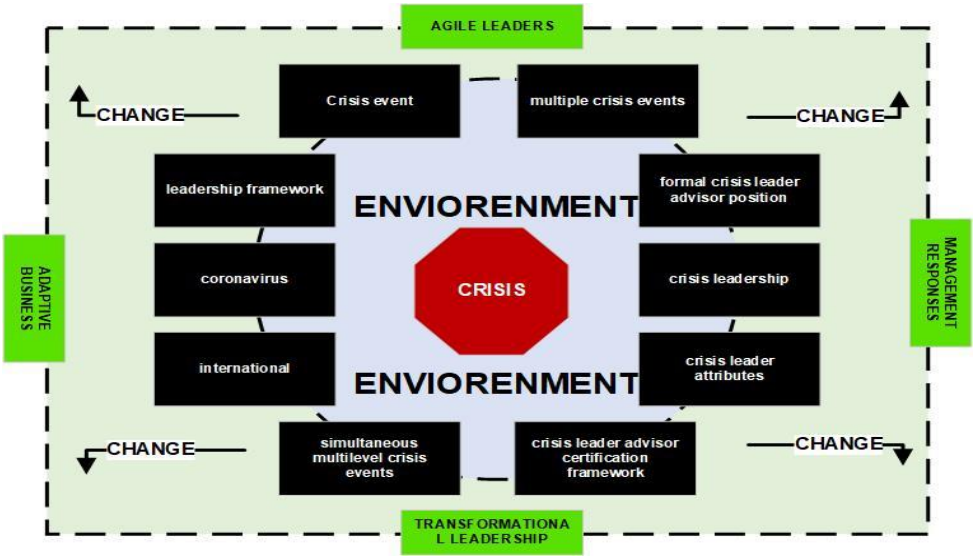

Figure 7 portrays a conceptual model resulting from the identification of previous research results that have a success value in responding to VUCA. VUCA problems are generally influenced by external factors that have uncertainty and ambiguity. At the time of VUCA, companies and organizations in developing countries were required to find survival techniques aided by expanded public policy prerogatives [37]. Based on the analysis of previous research studies, the VUCA condition forced companies and organizations to be able to adjust and had a clear direction of change. Changes and adaptations within the scope of organizations and companies had important keys to success in setting resilience strategies. The formulation of the follow-up framework in supporting changes in the organizational and business sectors

was required to create 1. Agile Leaders, 2. Adaptive Business, 3. Transformational Leadership, and 4. Management Responses.

Systematically, in optimizing several key factors to create significant change, this research has identified efforts that were made. In the aspect of Agile Leaders, companies can strive to produce efficient leaders, facing leaders today, formal leaders, great leaders, inclusive leaders, intelligent leaders, leader behaviour, leading design, leading innovation, leading millennial, leading organizations, responsible leaders, senior leaders, specific steps leaders and strategic leaders. In addition, on the Adaptive Business aspect, companies can seek several actions, such as: creating pathways, business decision-making, business domains, business innovation, business model innovation, business transformation, daily business operations, global business environment, meaningful business creation, as well as unique business model. In the aspect of Transformational Leadership, it can be directed to seeking style, transformational leadership, sustainable leadership, strong leadership, strategic leadership, responsible leadership, leadership style, leadership skills and agile leadership. Lastly, in the aspect of Management Responses, time management efforts, manager works, top management teams, performance management, agile management and human resource management are strongly needed.

4. Conclusion

The VUCA study has received serious attention from scholars as part of efforts to address the challenges and strategies of business organization sustainability in times of crisis. This study covers several research themes, including Innovation, Leadership, and COVID-19. The focus of the study on VUCA is the relevance of the main issue, namely the ability of business organizations to survive in the COVID-19 crisis. The COVID-19 crisis significantly affected the stability of business organizations which impacted the sustainability of business organizations. Uncertainty caused by fast-paced changes in the organizational environment was also part of the trigger for VUCA. The conceptual model of the business organization in responding to VUCA was emphasized on four important points, namely Agile Leaders; Adaptive Business; Transformational Leadership; and Management Responses. The conceptual model focused on the ability of business organizations to adapt and innovate in response to crises and changes that occurred.

The limitation of this research is that no in-depth study has been conducted that is directly related to the effect of VUCA on the stability of business organizations. In addition, the use of data in this study refers to the Scopus database which cannot fully describe VUCA studies around the world. However, methodologically, this research has a study limit that shows the scientific process in research that produces an overview and concept of VUCA in the business sector. Subsequent research needs to explain specifically the extent of the influence of VUCA on the stability and sustainability of business organizations which can simultaneously test the conceptual model that has been discussed in this paper.

References – (avoid links as much as you can), format references in the APA style. Example:

[1] Germundssona, L. B., Frankelius, P., & Norrman, C. (2021). The Role Of Innovation Intermediary Organisations In Forming Value Creating Meetings: The Agri-Food Firm Perspective. International Food and Agribusiness Management Review, 24(6), 992–1004. https://doi.org/10.22434/IFAMR2020.0167.

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