IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 4, September 2026
Impact Factor: 8.2

Pilot Study on Study of Organisational Response Towards Volatility, Uncertainty, Complexity and Ambiguity with Reference to Automotive Sector Businesses

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Abstract: *The automotive sector is increasingly operating in a Volatile, Uncertain, Complex, and Ambiguous environment shaped by rapid technological advancements, stringent regulatory frameworks, and shifting customer expectations. This study examines the organisational responses adopted by automotive firms to effectively navigate these dynamic conditions, while also exploring the relationship between such responses and stakeholder management practices. A quantitative research design is utilized, with primary data collected from 63 professionals working within the automotive industry. A structured questionnaire is employed to assess key strategic dimensions, including adaptability, innovation, resilience, and risk management. In parallel, stakeholder management is evaluated through variables such as communication effectiveness, stakeholder engagement, and trust-building initiatives. The collected data is analyzed using both descriptive and inferential statistical techniques to ensure comprehensive insights. The findings of the study indicate a significant positive relationship between strategic response and stakeholder management. Organizations that demonstrate higher levels of adaptability and proactive strategic behavior are more successful in maintaining strong and meaningful relationships with their stakeholders. These firms are better equipped to respond to uncertainty and are more resilient in the face of external disruptions. Furthermore, the study highlights that proactive and flexible strategies contribute to improved decision-making processes and overall organizational performance. It underscores the importance of incorporating stakeholder perspectives into strategic planning to ensure alignment with evolving expectations. Effective stakeholder management not only strengthens trust and collaboration but also supports long-term sustainability and competitive advantage.Overall, this research provides valuable insights into how automotive firms can successfully operate in uncertain environments by integrating robust strategic responses with strong stakeholder engagement practices.*

Keywords: Volatility, Uncertainty, Complexity, Ambiguity, Automotive Sector, Organisational Response, Adaptability, Resilience, Agility

I. INTRODUCTION

This research examines how businesses in the automotive sector respond to the Volatility, Uncertainty, Complexity, Ambiguity problem of the business environment. This research aims to understand and suggest techniques used by certain automotive industry enterprises in Pune and the PCMC area to deal with these problems. Over the last several decades, globalisation, technology improvements, and shifting customer behaviour have all significantly changed the corporate world. A VUCA environment, which is marked by quick changes in market dynamics, erratic economic situations, complex supply chains, and unclear regulatory environments, has resulted from these developments. This

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proposal aims to investigate the VUCA environment's issues, their effects on Pune's and the PCMC area's automotive sector enterprises, and how these businesses respond to VUCA. A volatile, uncertain, complex, and ambiguous (VUCA) environment characterises the current corporate landscape. This article examines how companies in the automobile industry react to the VUCA environment and the ensuing interactions with their stakeholders.

A. Background of the Study

The global automotive industry has been rapidly transformed by technological innovation, shifting customer preferences, globalization, and regulatory pressures. This has created a VUCA (volatile, uncertain, complex, ambiguous) environment marked by demand fluctuations, supply chain disruptions, and evolving market signals. Disruptive technologies like electric vehicles, autonomous driving, and digital mobility platforms have intensified these challenges, pushing companies to become more agile and innovative.External shocks such as pandemics and geopolitical conflicts have further exposed vulnerabilities, making resilience and adaptability essential. In this context, effective stakeholder management—balancing the needs of customers, governments, employees, investors, and suppliers—has become critical for maintaining trust and achieving long-term success.

B. Objectives of the Study

1. To understand key elements of Volatility, Uncertainty, Complexity, Ambiguity and their implications with respect to Automotive Sector Businesses.
2. To identify organisational responses of select automotive sector businesses towards Volatility, Uncertainty, Complexity, Ambiguity of the business environment
3. To identify the challenges faced by select automotive sector businesses due to Volatility, Uncertainty, Complexity, Ambiguity of the business environment.

C. Hypotheses of the Study

- H1: Volatility, Uncertainty, Complexity, and Ambiguity have a significant impact on the performance and strategic functioning of automotive sector businesses.
- H2: Automotive Sector Businesses responds towards Volatility, Uncertainty, Complexity, and Ambiguity of the business environment.
- H3: The Volatility, Uncertainty, Complexity, and Ambiguity in the business environment significantly contributes to operational, financial, and supply chain challenges in automotive sector businesses.

II. LITERATURE REVIEW

Deepak Pandit et.al (2017) examining how dynamic capabilities (DCs) at the firm level actuate DI manifestation, our research reinterprets the phenomena in the context of developing economies and provides a set of conclusions that center on the characteristics of DCs necessary for such manifestation.

Cox Automotive UK Limited (2022) According to Cox Automotive, the term VUCA, which stands for volatility, uncertainty, complexity, and ambiguity, is probably going to be the next major buzzword for the automotive sector and, more particularly (Cox Automotive UK Limited, 2022).

Mohandas Udyavar et.al (2024) The COVID-19 epidemic is posing serious problems for the automobile sector, which employs over 50 million people and is a major contributor to the world economy. Sales of passenger cars are expected to fall precipitously worldwide, from 79.6 million in 2017 to 60.5 million in 2020 (Mohandas Udyavar, 2024).

Sudeep bhatta (2024) The VUCA era Volatile, Uncertain, Complex, and Ambiguous is causing a radical change in the automotive design scene, requiring designers to quickly adjust to new possibilities and problems. While uncertainty needs flexibility to handle legislative changes and technology improvements.

Kotha Raj Kumar Reddy et.al (2021) Demand volatility, process unpredictability, supply chain complexity, and information ambiguity all contribute to a VUCA reality. Blockchain is one of the growing technologies that industries are using for business excellence in order to handle this situation. A viable option to add transparency and traceability to a conventional ecosystem is through blockchain technology (BCT) (Raj Kumar Reddy, Gunasekaran, Kalpana, Raja Sreedharan, & Arvind Kumar, 2021).

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Manimuthu Arunmozhi et.al (2021) With the quick use of artificial intelligence (AI) in manufacturing, real-time monitoring is becoming a crucial part of smart manufacturing. The Internet of Things (IoT) and machine learning (ML) algorithms improve the resilience and dependability of the volatility, uncertainty, complexity, and ambiguity (VUCA) world in a stable industrial setting (Manimuthu, Venkatesh, Raja Sreedharan, & Mani, 2022).

Sampath Boopathi et.al (2024) makes use of a thorough examination of the tactics and programs put in place by the chosen automakers. It provides a comprehensive knowledge of the steps these organisations use to accomplish their objectives via a study of pertinent literature, case studies, financial data analysis, and interviews with important industry experts. (Boopathi & Kautish, 2024).

Elisa Giacosa et.al (2022) examined how digitisation and customer agility affected the everyday operations and reorganisation of an automobile industry. We provide an empirical case study based on the literature on agility in order to investigate the relationship between agility and digital transformation. (Giacosa, Culasso, & Crocco, 2022).

Jennifer Lechner et.al (2023) An increasing number of sectors are being impacted by the revolutionary developments of a VUCA environment. Focusing on the automobile sector, this is brought on by a number of emerging market or technological developments. This circumstance calls for a high degree of flexibility and raises concerns about resilience and sustainability in system development efforts. (Lechner & Schlüter, 2023).

M. Dudi Abdullah (2023) The purpose of this research is to determine and evaluate the possible obstacles posed by VUCA to the growth of Indonesia's automotive sector and their effects on business performance. Descriptive and verification research methodologies were used in this study. (Dudi Abdullah, 2023).

The remaining studies included in the literature review primarily focus on the general concept of the Volatility, Uncertainty, Complexity, and Ambiguity of the business environment across various industries such as tourism, education, public services, and overall business management. While these studies provide valuable theoretical insights and a broader understanding of organisational responses, leadership approaches, and organizational adaptability, they are not directly specific to the automobile sector. Therefore, for the purpose of this research, only those studies that are closely related to the automotive industry have been selected for detailed analysis. The other studies have been reviewed to build conceptual clarity and theoretical background. Hence, only the selected automobile-related studies are taken here for further discussion and interpretation. The questionnaire for this present study has been carefully designed based on an in-depth review of the overall literature, particularly focusing on the selected automobile sector studies. In addition to the literature review, inputs were also gathered through discussions and informal interviews with respondents, including industry professionals and stakeholders for designing the questionnaire. These interactions helped in identifying key variables, current challenges, and practical insights related to the Volatility, Uncertainty, Complexity, and Ambiguity of the environment in the automotive sector. Thus, the questionnaire reflects both theoretical foundations and real-world perspectives, ensuring its relevance, reliability, and effectiveness in achieving the research objectives.

A. Research Gap

Existing research on this specific geographic region and automotive sector leaves a research vacuum in the study of Organisational Response of automotive sector businesses towards Volatility, Uncertainty, Complexity, and Ambiguity of the environment in Pune and PCMC area. While the implications of Volatility, Uncertainty, Complexity, and Ambiguity on organisations have been studied, there is a lack of in-depth research on the unique challenges and responses of select automotive manufacturers in this area. Understanding how these organisations navigate such an environment and can provide valuable insights for enhancing organizational resilience and effective stakeholder management strategies. This study seeks to address this knowledge gap and contribute to the existing corpus of knowledge regarding this region and industry.

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III. RESEARCH METHODOLOGY

The study uses a quantitative, descriptive, and correlational research approach to examine how automotive firms respond to the Volatility, Uncertainty, Complexity, and Ambiguity of the environment. Primary data is collected from 63 automotive professionals involved in strategy and stakeholder engagement using a structured questionnaire based on dimensions like adaptability, innovation, resilience, and risk management, along with communication, engagement, and trust-building. A convenience sampling method is adopted, and responses are measured on a five-point Likert scale.The questionnaire is developed using existing literature and insights from industry discussions in Pune and PCMC. Reliability is ensured through pilot testing and Cronbach's alpha (above 0.7). Data is analyzed using descriptive statistics and inferential tools such as correlation and regression. Ethical standards, including informed consent, confidentiality, and voluntary participation, are strictly maintained.

IV. DATA ANALYSIS

A. Reliability Analysis

TABLE I. CASE PROCESSING SUMMARY

Case Processing Summary			
		N	%
Cases	Valid	62	98.4
	Excluded[a]	1	1.6
	Total	63	100.0

The case processing summary indicates that out of a total of 63 cases, 62 cases (98.4%) were valid and included in the analysis, while only 1 case (1.6%) was excluded due to missing or incomplete data. This high proportion of valid responses suggests that the dataset is largely complete and reliable, providing a strong basis for statistical analysis and interpretation. The minimal exclusion of cases also indicates good response quality and consistency among respondents, enhancing the credibility of the study's findings.

TABLE II. RELIABILITY STATISTICS

Reliability Statistics	
Cronbach's Alpha	No of Items
.851	60

The reliability analysis shows a Cronbach's Alpha value of 0.851 for the 60 items included in the scale. This value exceeds the commonly accepted threshold of 0.70, indicating a high level of internal consistency among the items. The result suggests that the questionnaire is reliable and that the items consistently measure the underlying constructs related to organizational resilience and stakeholder management in a VUCA environment. Therefore, the scale used in this study can be considered dependable for further analysis and interpretation.

TABLE III. ITEM-TOTAL STATISTICS FOR VUCA CHALLENGE ITEMS

Item-Total Statistics				
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Our Organisation often see sudden changes in orders from vehicle makers (OEMs).	402.00	952.885	-.155	.855
Changing prices of materials like steel and aluminium affect our profits	401.85	912.946	.431	.848

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Sudden changes in fuel prices or new government rules create problems for our work	401.65	910.331	.475	.847
We are not sure how fast electric vehicles will replace regular ones.	402.15	925.438	.221	.850
Sudden changes in government policies make it hard to plan our business	402.39	929.159	.153	.851
Problems with other countries (like China, USA, etc) make it harder to get parts on time	402.26	917.867	.279	.849
Following many different rules and standards takes a lot of effort	402.13	947.983	-.083	.854
Different customers want different parts, which makes production difficult	402.03	939.868	.027	.852
If one part of our supply chain has a problem, it affects the whole system	401.82	932.706	.127	.851
It's hard to know which electric vehicle technology will become most popular	402.02	933.918	.102	.851
Lack of clarity in customer expectations and technology trends affects our decision-making	401.92	915.747	.351	.848
Some government policies are not clear, which makes our work more difficult	401.94	921.340	.263	.849
Changes in the Government policies like GST, Emission norms like BSVI, Sustainability, etc have affected our business or affect our business.	401.94	918.684	.412	.848
Economic factors such as fuel prices, interest rates, etc affect the business of our Organisation	402.19	944.191	-.038	.853
Changing customer demands, preferences, regulatory shifts, competition, etc affect the way in which our business is done	401.85	940.028	.019	.852
Problems with suppliers, new government rules, financial risks, supply chain disruptions, fluctuating demands, inflation, quality standards of suppliers, etc affect our business	402.02	940.869	.008	.853
Our Organisation has to use various softwares and smart tools (for ex-SAP, Predictive Analytics, IoT, Tableau, etc) to watch sales and production in real time in a VUCA environment	401.97	937.769	.054	.852
Customer online search behavior regarding the products also affects our	402.11	942.036	-.013	.853
Our Organisation has to keep itself updated about the current business environment like Legal developments, market signals, industry level risks, etc in order to sustain in VUCA environment	402.06	920.324	.311	.849

The item–total statistics indicate strong internal consistency of the scale (Cronbach's Alpha = 0.851), with no item significantly improving reliability if deleted. Key items such as material price fluctuations, policy changes, fuel

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volatility, and regulatory impacts show strong correlations, reflecting core VUCA challenges. Some items related to technology, supply chains, and customer diversity show lower but acceptable correlations, while a few items exhibit very low or negative correlations, indicating varied perceptions. However, their removal does not meaningfully improve reliability. Overall, the scale is stable, comprehensive, and suitable for analyzing VUCA-related organizational challenges.

TABLE IV. ITEM-TOTAL STATISTICS FOR ORGANISATIONAL RESPONSE ITEMS

Item-Total Statistics				
	Item-Total Statistics	**Item-Total Statistics**	**Item-Total Statistics**	**Item-Total Statistics**
Our Organisation has to participate in meetings with industry groups (For Ex- Marattha Chamber of Commerce, Inductries & Agriculture, ARAI, SIAM, etc) and Government officials to stay informed about the current business environment	401.97	920.786	.288	.849
Our Organisation use government schemes like Make-in-India, digital india to support our business	401.71	920.734	.309	.849
Our Organisation has to bring flexibility in Managing its various Projects, to make the Projects successful as far as possible, especially in a VUCA environment	402.13	938.278	.035	.852
Our Organisation tests newly manufactured products in small quantity	402.08	927.354	.214	.850
Our Organisation has to train their Managers, Executives, etc to make fast and smart decisions in uncertain times	402.05	927.686	.196	.850
There is sudden increase or decrease in production or sales of the Company due to economic slowdown, policy changes, fluctuations in demand for automotive parts, changing customer preferences, etc	402.15	924.520	.230	.850
A Sudden implementation or changes in government policies (e.g., BS-VI emission norms) create volatility in product requirements and production processes	401.89	924.987	.224	.850
Defining (developing) and Implementing a good Supply Chain Strategy is one of the Key Challenge for the Organisation	401.84	943.154	-.022	.853
Plant Closures, Port Closures, Transport related issues, etc create various challenges in front of the Supply Chain system of our Organisation	402.32	922.353	.258	.849
Global Commodity Markets (Raw materials) and Supply Chain disruptions like Natural disasters, Geopolitical conflicts, Logistical issues, fluctuating demand, etc bring changes in the prices of Raw Materials like Steel, Aluminium, Rubber, Plastics, etc	401.69	933.331	.120	.851
Rapid advancement in automotive technologies such as Electric Vehicles makes it uncertain for the organisation to predict, which product line or technologies will dominate the market	401.56	918.971	.310	.849

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Rapid advancement in automotive technologies such as Electric Vehicles, Hydrogen Powered Vehicles, etc create investment risks for Automotive Ancillary Firms	402.00	921.607	.225	.850
Events like pandemic, supply chain disruptions, trade restrictions, geopolitical conflicts cause unpredictable delays or shortages in critical components, parts especially since the ancillary business also has to rely on global sourcing sometimes	401.95	916.866	.312	.849
Customers like OEMs (Original Equipment Manufacturers), Other Ancillary Firms, etc demand high-quality, customized, and just-in-time delivery with complex quality ertifications and traceability, which increases operational (functional) complexity for Auto	401.98	917.852	.317	.849
Auto Ancillary Firms must coordinate with multiple Domestic Stakeholders & International Stakeholders, manage logistics, comply with national & international standards, in order to Integrate their supply chain domestically as well as internationally	401.90	936.777	.071	.852
Sustainable Supply Chain Management (SSCM) has become a major challenge for our Organisation due to VUCA environment	401.71	924.078	.259	.850
Automotive Ancillary Firms have to co-ordinate with many sub-suppliers which increases complexity in quality control, timelines, cost competitiveness, cost management, etc	402.02	915.360	.331	.848
While Government policies are promoting EVs but at the same time the infrastructure required for EVs like charging stations, battery recycling, etc is still developing unevenly, which is creating Ambiguity among Auto Ancillary Firms	401.79	921.808	.296	.849
Evolution of Disruptive Innovation (DI) in the Automotive sector, has	401.89	940.954	.008	.852
New entrants in the Automotive Market such as technology companies or startups are entering automotive supply chains, which in turn are disrupting (unsettling) traditional roles and blurring industry boundaries of Automotive Market.	401.76	946.481	-.074	.853

The item–total statistics show strong internal consistency of the scale, with Cronbach's Alpha remaining high and stable, indicating that no item significantly weakens reliability. Several items—such as technological advancements, supply chain disruptions, stakeholder coordination, and customized customer demands—show moderate to strong correlations, highlighting their relevance to VUCA conditions. Some items, including project flexibility, training, and sustainability practices, show lower correlations but remain conceptually important in understanding organizational responses. A few items with very low or negative correlations reflect broader strategic challenges but do not significantly affect reliability. Overall, the scale is balanced, reliable, and effectively captures organizational challenges and responses in a VUCA environment.

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TABLE V. ITEM-TOTAL STATISTICS FOR STRATEGIC RESPONSE ITEMS

Item-Total Statistics				
	Item-Total Statistics	**Item-Total Statistics**	**Item-Total Statistics**	**Item-Total Statistics**
Due to unclear growth trajectories (path) in automotive sectors, especially with the transformation towards green mobility and digitalization, Bank and Investors are cautious while providing Loans/Capital/Funds to Auto Ancillary Firms	402.10	918.876	.315	.849
Rapid changes/shifts in customer expectations for sustainability, safety, and technology integration leave automotive businesses ambiguous (unclear) about product design and innovation priorities	401.87	927.360	.200	.850
Our Organisation should identify and compare its strengths with outside	401.95	920.112	.314	.849
Our Organisation should identify the risks like problems with suppliers, new Government rules, financial risks, supply chain disruptions, fluctuating demands, inflation, quality standards of suppliers, etc to respond to the Volatility in the Automotive Se	401.77	923.456	.276	.849
Our Organisation should forecast and make different plans as per changing customer demands, preferences, regulatory shifts, competition, etc to respond to the Volatility in the Automotive Sector/Market	401.63	929.483	.187	.850
Our Organisation should always be prepared for changes happening in vehicle related rules & regulations like pollution standards (emission norms), Government policies, Sustainability, etc to respond to/counter the Volatility in the Automotive Sector	401.82	923.525	.240	.850
Our organization should make Long term agreements with Suppliers, etc to respond to the Volatile business environment of Automotive Sector	401.87	929.065	.178	.850
Our organization should always make efforts to make the manufacturing processes in such a way, which can bring flexibility into Production systems & meet fluctuating demand, to respond to the Volatility of Automotive Sector/Market	402.06	931.242	.155	.851
Our organization should adopt "Generic Systems Engineering" process to manage the complex systems in a vehicle, from concept to production. This can help the Organisation to respond to/counter the Volatility of Automotive Sector/Market	401.98	925.885	.205	.850
Our Organisation should identify & use various techniques like Just In Time (JIT), & AI based Inventory Management system, to optimize the Inventory, reduce wastage stockouts, etc which can also help to respond to/counter Volatility in the Automotive Sect	401.92	926.075	.242	.850
Our Organisation should identify & use Compliance Methods like early stage design, testing, risk assessement, Supplier audit ,Inspection, record keeping etc to align (match) itself with the Legal requirements. This can help the Organisation to respond to/	401.77	935.260	.093	.851

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Our Organisation should serve multiple/various OEMs (Original Equipment Manufacturers) across domestic & export markets, in order to diversify the client base & also to respond to/counter Uncertainty in the Automotive Sector/ Market	402.15	911.700	.413	.848
Our Organisation should identify & adopt/use Risk Management systems like BCP (Business Continuity Planning) to respond to/reduce/counter the impact of Uncertainty on our business	401.85	924.684	.302	.849
Our Organisation should identify & adopt/make use of various Industry 4.0 practices like Circular Economy, AI, IoT (Internet of Things), Robotics, Data Analytics, etc to respond to/counter the Uncertainty in the Automotive Sector/ Market	401.95	929.162	.178	.850
Our Organisation should identify Dynamic Capabilities (DCs) like Sensing, Seizing, Reconfiguring the resources, etc to counter as well as achieve Disruptive Innovations. This can help our Organisation to respond to/counter the Uncertainty in the Automotiv	401.98	922.311	.233	.850
Our Organisation should review and update the supply chain strategy from time to time to align (match) their existing capabilities with the changing market requirements and also for acquiring new capabilities, etc. This can help our Organisation to respon	401.98	922.705	.303	.849
Our Organisation should identify Local Suppliers for sourcing the materials like Raw Materials, Critical Parts, etc as far as possible, in order to reduce the dependency on imports, which in turn can help our Organisation to respond to the Uncertainty in	401.79	919.808	.304	.849
Our Organisation should identify & develop certain components, parts by Collaborating/Partnering with OEMs in order to bring Innovative components, parts, etc. This can help our Organisation to respond to the Uncertainty in the Automotive Sector	401.81	934.224	.109	.851
Our Organisation should identify & make investment in R & D, Testing, Innovation etc to respond to the Ambiguity in the Automotive Sector	401.95	922.014	.254	.850
Our Organisation should conduct preliminary tests of new technologies, processes to be used, on a small scale, before using them to make products, to respond to the ambiguous business situations	401.77	928.243	.197	.850
Our Organisation should regularly Upskill its Workforce like Executives, Managers, etc especially in the areas like AI, Robotics, Data Analytics, etc in order to respond to the internal Ambiguous environment of organization	401.79	916.857	.328	.849

The item total statistics indicate strong reliability of the scale, with Cronbach's Alpha remaining around 0.85, showing that no individual item weakens internal consistency. Several items such as diversification, supply chain review, business continuity planning, and workforce upskilling show strong correlations, highlighting their importance in addressing VUCA challenges. Other items related to forecasting, Industry 4.0, and collaboration exhibit moderate correlations, reflecting supportive strategic roles. A few items show low correlations, suggesting they are perceived as

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routine practices, but their removal does not significantly improve reliability. Overall, the scale is balanced, consistent, and effectively captures the multidimensional organizational responses to VUCA conditions, making it suitable for further analysis.

TABLE VI. ANOVA WITH COCHRAN'S TEST

ANOVA with Cochran's Test						
		Sum of Squares	df	Mean Square	Cochran's Q	Sig
Between People		513.513	61	8.418		
Within People	Between Items	180.999	111	1.631	143.882	.000
	Residual	8476.358	6771	1.252		
	Total	8657.357	6882	1.258		
Total		9170.870	6943	1.321		

The ANOVA and Cochran's Q test results indicate meaningful differences among respondents and across questionnaire items. Respondents vary in their perceptions of VUCA challenges, resilience, and stakeholder management, while the significant Cochran's Q value ($p < 0.001$) confirms that items measure distinct dimensions. The relatively low residual variance suggests good consistency in responses. Overall, the results, along with a high Cronbach's Alpha (.851), confirm that the scale is reliable, internally consistent, and effective in capturing key aspects of strategy and stakeholder management in a VUCA environment.

V. CONCLUSION

The purpose of this research is to understand how automotive businesses in Pune and the PCMC region strategically adapt to a VUCA (Volatile, Uncertain, Complex, and Ambiguous) environment. It examines the challenges posed by VUCA conditions and the strategies firms adopt to enhance resilience and ensure effective stakeholder management. The study also explores how VUCA impacts key stakeholders such as customers, employees, investors, and regulators—and how these relationships influence strategic flexibility. Overall, the research aims to provide practical and theoretical insights to help automotive firms strengthen adaptability, maintain strong stakeholder relationships, and make effective decisions in uncertain environments.

ACKNOWLEDGMENT

I, Saurabh Joshi, expresses sincere gratitude to the respondents, industry professionals, and academic mentors who supported the completion of this research paper on pilot study.

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