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Being Affected By VUCA Factors? Developing The "Perceived VUCA Exposure" Scale

VUCA Faktörlerinden Etkileniyor Musunuz? "Algılanan VUCA Maruziyeti" Ölçeği Geliştirme

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Öz

Çağdaş iş ortamlarının hızla gelişen ve sıklıkla öngörülemez doğası, Oynaklık, Belirsizlik, Karmaşıklık ve Muğlaklık (VUCA) ile nitelendirilerek, hem kuruluşlar hem de bireyler için önemli zorluklar oluşturmaktadır. Bu VUCA faktörlerinin nasıl algılandığı ve deneyimlendiğine dair detaylı bir anlayışın gerekliliğini fark eden bu çalışma, bireylerin profesyonel ortamlarındaki VUCA algılarını nicel olarak değerlendirmek için tasarlanmış yeni bir araç olan "Algılanan VUCA Maruziyeti" ölçeğini tanıtmaktadır. Madde oluşturma, uzman görüşleri pilot analizler, ve faktör yapısına yönelik gözlemler içeren titiz bir metodolojik yaklaşım aracılığıyla geliştirilen bu ölçek, çeşitli istatistiki doğrulayıcılar tarafından doğrulanmıştır. Ölçeğin yapısal geçerliliğini belirlemek için açıklayıcı ve doğrulayıcı faktör analizleri kullanılırken, güvenilirlik iç tutarlık ve test-tekrar test yöntemleriyle sağlanmıştır. Yapılan analizler sonucu ölçek, literatürde aktarıldığı gibi VUCA'nın her bir yönüne karşılık gelen dört faktör içermektedir (Oynaklık, Belirsizlik, Karmaşıklık ve Muğlaklık). Bulgular, ölçeğin güçlü psikometrik özellikler sergilediğini, algılanan VUCA maruziyetini değerlendirmede güvenilir ve geçerli bir araç olduğunu ortaya koymaktadır. Ayrıca, çalışma birey ve organizasyon boyutunda deneyimlenen VUCA boyutlarının farklı ancak birbiriyle bağlantılı doğasına dair ampirik kanıtlar sağlamaktadır. “Algılanan VUCA Maruziyeti” ölçeği, organizasyon boyutunda araştırma ve uygulama için önemli sonuçlar taşımaktadır. VUCA faktörlerinin çalışanlar üzerindeki etkisini daha derinlemesine anlamayı sağlar, değişken ortamlarda direnç ve uyum yeteneğini artırmaya yönelik çözümleri yönlendirir. Ayrıca, kuruluşların iş gücü üzerinde en derin etkisi olan VUCA alanlarını belirlemeleri için bir gözlem aracı olarak hizmet eder, böylece olumsuz etkileri hafifletmek ve VUCA dünyasının sunduğu potansiyel fırsatlardan yararlanmak için hedeflenmiş stratejiler geliştirmelerini sağlar.

Anahtar Kelimeler: Algı, Algılanan VUCA, Bireysel, Çalışan, VUCA, VUCA Maruziyeti

Abstract

The rapidly evolving and often unpredictable nature of contemporary business environments, characterized by Volatility, Uncertainty, Complexity, and Ambiguity (VUCA), poses significant challenges for organizations and individuals alike. Recognizing the need for a nuanced understanding of how these VUCA factors are perceived and experienced, this study introduces the “Perceived VUCA Exposure” scale, a novel instrument designed to quantitatively assess individuals’ subjective perceptions of VUCA in their professional milieu. Through a rigorous methodological approach, involving item generation, expert reviews, and pilot-test, the scale was developed and subsequently validated across diverse samples. The study employed exploratory and confirmatory factor analyses to establish the scale’s structural validity, while reliability was ascertained through internal consistency and test-retest methods. The final scale comprises four subscales, each corresponding to one aspect of VUCA (Volatility, Uncertainty, Complexity, and Ambiguity). The findings reveal that the scale exhibits robust psychometric properties, making it a reliable and valid tool for assessing perceived VUCA exposure. Additionally, the study provides empirical evidence on the distinct yet interconnected nature of the VUCA dimensions as experienced by individuals in organizational settings. The “PVE” scale holds significant implications for organizational research and practice. It facilitates a deeper understanding of how VUCA factors impact employees, guiding interventions to enhance resilience and adaptability in fluctuating environments. Furthermore, it serves as a diagnostic tool for organizations to identify areas of VUCA that most profoundly affect their workforce, enabling targeted strategies to mitigate adverse effects and capitalize on potential opportunities presented by the VUCA world.

Keywords: Individual, Employee, Perception, Perceived VUCA, VUCA, VUCA Exposure

Introduction

The advancement of smart technologies today, the proliferation of digitalization, and the production of robotic devices that have their own communication networks, while present in manufacturing, healthcare, and service industries, do not replace the human factor but still necessitate the need for humans. This is because, in environments involving humans, there are no uniform, fixed systems; instead, we live in a VUCA world characterized by unpredictable events, variable conditions, multifaceted relationships, and dilemmas encountered while making correct decisions.[1] An employee's perception of VUCA effects can change depending on individual experiences, skills, resilience, and capacity to adapt. On the other hand, the dynamics of the company, the nature of the industry, market conditions, management structure, and corporate strategies shape this perception. Addressing the impact of VUCA at both individual and corporate levels is important.[2] Employees' perceptions can be improved through personal development and training, while companies must develop flexible and resilient strategies to manage VUCA effects, possess agile structures, and embrace continuous learning. Thus, the VUCA effect exists at both individual and corporate levels and is critical for the success of both employees and companies. The products/services, raw materials, and technological investments offered by corporations and organizations still emphasize the importance of humans and indicate that they have become a more valuable asset than ever before.[3] Especially in the context of Industry 4.0 and Society 5.0, the emphasis on transformation suggests that higher efficiency and effectiveness are achieved through human-robot collaboration. Here, while the robot's task is to maintain the operation of fixed systems, the human's task is to introduce creative solutions against volatile, uncertain, complex, and ambiguous patterns, thereby ensuring continuity in the process.[4] However, it is not expected that individuals will continuously exhibit high performance, productivity, motivation, and job satisfaction based on emotions and behaviors because individuals' perceptions of conditions are differentiated into behavioral, cognitive, and emotional aspects and are shaped by external stimuli.[5] These external stimuli, which affect individuals' well-being, include health, economic freedom, happiness, and overall well-being, and have been negatively supported by recent factors such as the coronavirus pandemic, conflicts in the Middle East and Eastern Europe, global recession, and climate change. In such environmental conditions, it is natural to expect individuals to experience job burnout, fear of job loss, demotivation, toxic competitiveness, and task complexity. Although these negative environmental conditions may be seen as potential opportunities or ineffective for companies, employees' perceptions of change, uncertainty, complexity, and ambiguity can be affected negatively. Individuals typically feel the effects of VUCA in their daily workflows, career development, job engagement, motivation, job security, and well-being.[6] Vola-

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tility, uncertainty, complexity, and ambiguity can directly affect employees' stress levels and job satisfaction.[7] At the same time, individual characteristics such as education level, experience, and personal resilience influence their ability to perceive and cope with these effects.[8] While change provides companies and organizations with an environment for innovation and improvement, employees may fear job loss and job engagement due to the change itself. In uncertain environments, leaders aim to adapt to current conditions through learning while reflecting the vision identity during unforeseen developments, and the reflection of the chaotic climate caused by uncertainty in employees' perception can be seen as anxiety and fear effects.[9] These negative perceptions shaped by employees can slow down or disrupt the new order and problem-solving process management planned to be activated by the leader in competitive market conditions. Incorporating lean products and services into more complex frameworks with multiple features, along with globalization bringing mutual benefits and digitalization enabling access to unlimited information and data, increases the effort related to decision-making processes in complex environments and solutions discovered for defined problems.[10] Under these conditions, individuals may feel incompatibility in their tasks, burnout, loss of motivation, and fear of making mistakes.[11] In this context, individuals' flexibility in cognition (flexible thinking) can more effectively transform the process of addressing problems from different perspectives, thinking multiply, and increasing awareness of the analytical cause-and-effect relationship, thereby facilitating the process of simplifying complexity.[12] In ambiguous environments reflecting VUCA effects, individuals may face dilemmas in decision-making processes regarding which decision would be more beneficial for the company or organization, and these conditions can restrain the agility of the company or organization's action in a constantly changing industry-market environment.[13] Under these circumstances, an individual's ability to take risks and possess more tolerant qualities in ambiguous environments can positively impact the company's or organization's decision-making processes in terms of agility and quick adaptation to changing conditions.

Within the abovementioned dynamics, the Perceived VUCA Exposure (PVE) refers to the extent to which individuals or organizations perceive themselves to be exposed to conditions characterized by volatility, uncertainty, complexity, and ambiguity (VUCA). "PVE" is about how much volatility, uncertainty, complexity, and ambiguity an organization or individual perceives in their environment, influencing their strategic, leadership, and operational approaches. Understanding this perception is key to navigating modern organizational challenges effectively The perceived effect of VUCA keeps a significant role in areas such as individual (e.g., employee) and

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corporate decision-making, strategy formulation, risk management, and leadership skills.[14] This perception provides an understanding of how challenging the VUCA conditions are for the individual or organization and about their capacities to overcome or adapt to these situations. High-perceived VUCA exposure can lead to issues like increased stress, decision-making difficulty, and the necessity to adapt to change.[15] The VUCA world encourages workers to continuously learn, adapt, and be flexible, but this can also lead to increased workload and stress levels. Leaders can turn these exposures into opportunities positively by creating a company culture that values concrete examples of VUCA without employees directly experiencing them, observing their perceptions towards potential VUCA exposures, and through internal or external training, developing different leadership styles, providing learning environments, fostering team collaboration, and supporting integrity with open communication. Leaders, individuals, and organizations tend to develop flexibility, resilience, learning, and innovative capabilities to manage this perception creating opportunities for personal development as well as organizational growth and sustainability. As a consequence, it becomes important to observe individuals' perceptions and reactions to their perceived VUCA effects by developing a "PVE" scale that aims to measure to what extent individuals are affected by VUCA effects and to what extent they are exposed to perceived VUCA effects. Hence, this research study has the purpose of developing the "PVE" scale through preliminary and final studies with the support of statistical analysis and a comprehensive literature review pointing out the "PVE".

Theoretical Background

The term VUCA was originally coined by the US Army War College to describe the volatile, uncertain, complex, and ambiguous nature of the global system in the aftermath of the Cold War.[16] It was primarily used in military literature to understand the challenges of the battlefield and guide flexible leadership actions.[17] Over time, the concept of VUCA has expanded to various fields, including state policies and everyday life.[18] In today's world, characterized by an abundance of data, news, and global developments, the VUCA framework highlights the need for swift response to unforeseen and unknown circumstances, minimizing potential losses.[19] However, the VUCA environment leaves little room for hesitancy, rigidity, and slow responsiveness when it comes to recognizing risks, addressing unforeseen issues, and dealing with the outcomes of challenges.[20] The VUCA factors, which are volatile, uncertain, complex, and ambiguous, cannot be accurately predicted or calculated using traditional forecasting techniques or mathematical models.[21] It is an ongoing and ever-changing condition that presents constant challenges and limitations, testing the decision-making capabilities, problem-solving skills, and adaptability of indi-

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viduals and organizations.[22] Within the VUCA concept, it's possible to identify the environment through three key dimensions: globalization, competition, and rapid technological change.[23] In this dynamic environment, transforming threats into opportunities becomes crucial for business leaders and managers, as the VUCA factors continue to shape market fluctuations, price volatilities, macroeconomic indicators, and supply chains.[24] To mitigate the negative effects of VUCA, organizations strive to cultivate comprehensive thinking, develop new business models (such as mergers and acquisitions and project partnerships), and drive innovation.[25] The aim is to navigate the VUCA environment by anticipating and adapting to change, rather than being overwhelmed by it. In the contemporary VUCA environment, change can be both invigorating and unsettling for individuals, depending on the nature and speed of transformation.[26] Volatility, as one of the VUCA factors, represents the rate of change, market fluctuations, and the instability of a continuous flow.[27] It is a critical factor that can disrupt daily routines and decision-making processes, as it occurs without a specific procedure, tool, or information to mitigate its effects.[28] Volatility manifests through dynamically changing decisions and outcomes, both internally and externally, within industries and organizations, often in undefined time intervals.[29] It influences personal decisions and can impact the goals and beliefs that individuals uphold within leadership in volatile environments.[30] Lerner et al., (2015) suggest that decisions and plans can be influenced by changes in people's emotions and aspirations rather than strict rules.[31] These fluctuations in employee satisfaction and efficiency can lead to adverse outcomes, such as increased stress and distrust levels, which ultimately impact psychological well-being.[32] The uncertainty and volatility that businesses face can also contribute to higher employee turnover rates, as feelings of dissatisfaction may arise among employees.[33] The notion that individuals are inherently resistant to change impedes the ability of

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organizations to comprehend and address genuine organizational issues effectively.[34] Resistance can frequently encompass a state of ambivalence in which the emotions, actions, and cognitions of employees regarding the change are not unequivocally aligned or consistent.[35] It is anticipated that resistance will exhibit a relationship with a spectrum of occupational outcomes, including levels of job satisfaction and the degree of commitment to the organization.[36] The circumstances precipitating change were prognostic of employee opposition to such change, which subsequently was linked to diminished job engagement and an increased propensity to quit.[37] The concept of "uncertainty" arises when there are no clear answers to questions about future events and challenges, leading individuals to feel worried and confused.[38] The level of uncertainty intensifies when conditions are uncontrolled and produce chaotic outcomes.[39] Uncertain events make relationships, decision processes, and collaborations among employees more fragile due to decreased tolerance for uncertainty and the desire for quick information caused by rapid changes.[40] Uncertainty refers to situations where there is a lack of knowledge and unpredictable outcomes.[41] In a changing environment, uncertainties can make employees feel insecure, fearful, and anxious, leading to poor performance, negative attitudes, and misperceptions.[42] Scholars have observed anti-change perceptions and behaviors among employees by analyzing their responsiveness and adaptability during organizational change processes.[43] The perception of uncertainty among individuals creates stress when changes occur in the work environment.[44] To cope with uncertain situations, particularly in volatile, uncertain, complex, and ambiguous (VUCA) environments, organizations should emphasize the adoption of flexibility skills to enhance employee performance, motivation, and communication.[45] "Complexity" refers to the abundance of information and interconnectedness within today's organizations.[46] Navigating complex business cycles requires a

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comprehensive thinking approach and lean solutions to drive progress during challenging times.[47] Complexity increases significantly when organizations must handle interconnected variables in exhausting business processes within a chaotic environment.[48] When complexity combines with uncertainty in the business environment, employees may consider intrapreneurship as a means to develop collaborative solutions and improve business cycles.[49] Complexity influences the cognitive and emotional reactions of both managers and employees, which are influenced by values, perceptions, and motivations.[50] Managers should strive to eliminate task complexities to enhance business performance and minimize negative emotions among employees, thereby preventing unfavorable decisions resulting from mental overload, conflict, and time constraints in VUCA conditions.[51] "Ambiguity" refers to dilemmas and instabilities that hinder decision-making due to a lack of similar past experiences and the inability to predict outcomes.[52] Ambiguity creates challenges for individuals as they struggle to make informed decisions in unfamiliar situations. According to Thoren & Vendel (2018), the complexity, disagreement, and lack of knowledge associated with the VUCA structure contribute to the challenges associated with ambiguity.[53] Ambiguity refers to a situation where there is a lack of clarity and an increase in information and choices, leading to confusion during decision-making.[54] Unlike uncertainty, which is characterized by a lack of information, ambiguity also involves a lack of understanding of cause-effect relationships between variables and confusion about the appropriate action plans, strategies, and potential effects.[55] Ambiguity is influenced by psychological factors such as perception, creativity, critical thinking, job satisfaction, and attitudinal behaviors.[56] These drivers of perception are closely tied to emotions, which impact the brain's decision-making processes in ambiguous situations under VUCA conditions.[57] By transforming VUCA conditions into vision, understanding, clarity, and agility, businesses

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can achieve sustainability and gain a competitive advantage by being innovative and market leaders.[58] Transformational leaders in organizations aspire to foster employee loyalty, self-determination, and productive corporate culture, motivating employees to generate new enhancements and innovations amidst the rapid changes brought about by VUCA.[59] For maintaining employee performance in turbulent and unpredictable VUCA situations, business leaders and decision-makers aim to develop an adaptive structure and solution environment as part of the corporate culture. Individual perception plays a crucial role in observing and understanding the VUCA factors, as it influences how individuals interpret and make sense of their environment.[2, 15] For example, two individuals may perceive a situation as uncertain, but one may see it as an opportunity for growth and innovation, while the other may see it as a threat.[60] Therefore, individual perception significantly impacts how individuals respond to and manage the VUCA factors. Moreover, perception also affects how individuals prioritize and address different mechanisms behind the perceived VUCA, thereby influencing decision-making and problem-solving effectiveness.[61] Rapidly changing market conditions increase the need for continuous adaptation among employees. This can escalate stress levels and diminish their confidence in job security. In a volatile environment, employees may frequently need to learn new skills, enhancing their propensity for learning and flexibility. Situations that cause high "PVE" can lead to increased stress and anxiety among employees. Uncertainty and volatility can make it difficult for employees to predict the future, resulting in feelings of insecurity. Ambiguous and complex environments complicate decision-making processes, making them more arduous and risky. Employees may be forced to make decisions based on incomplete or ambiguous information, requiring heightened attention and careful consideration. Complex work processes and organizational structures can make it challenging for employees to understand their roles and responsibilities. Complexity also necessitates the development of problem-solving skills and can encourage creative thinking. In conditions of low "PVE", employees are observed to work much more effectively within mechanisms of innovation and creativity. Ambiguous outcomes and information can lead employees to question their own decisions. This may drive a greater search for information and promote analytical thinking, but it can also increase anxiety and indecision.

Research Methodology

This study used a cross-sectional research design to develop a scale to measure perceived exposure levels to VUCA factors, in account of individuals' behavioral and cognitive responses. The cross-sectional research design is an observational research method frequently employed across various fields such as psychology, sociology, public health, and market research. It involves analyzing data from a specific population or a representative subset at a particular point in time.[62] When the literature on using scales in research is examined, it is seen that

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60 Minciu, M., Berar, F. A., & Dima, C. (2019, October). The opportunities and threats in the context of the VUCA World. In Proceedings of the 13th International Management Conference on Management Strategies for High Performance (IMC), Bucharest, Romania (pp. 1142-1150).

61 van Dam, K. (2018). Feelings about change: The role of emotions and emotion regulation for employee adaptation to organizational change. In Organizational Change (pp. 67-77). Routledge.

62 Creswell, J. W., & Creswell, J. D. (2017). Research design: Qualitative, quantitative, and mixed methods approaches. Sage publications.

researchers either use existing scales or develop scales themselves within the scope of their research.[63] In both cases, the structure of the measured variable and the structures associated with this variable must first be defined.[64] In the scale development procedure aimed at observing individuals' "PVE" levels, the steps outlined by DeVellis (2017) were followed.[65] These steps initially involved confirming the existence of studies pertinent to the causal rationale for the scale's development and conducting a comprehensive literature review to generate a preliminary. The detailed literature review yielded a pool of items, which was then presented to experts for feedback on the items' accuracy, appropriateness, and face validity. In this study, reviews were contributed by 7 white-collar employees (keeping managerial & non-managerial roles) in the manufacturing industry and 5 researchers active in the field of management & organization, serving as "experts." The item pool was composed of various scales, such as resistance to change, intolerance of uncertainty, cognitive flexibility, and tolerance of ambiguity developed by Oreg (2006)[66], Carleton et al. (2007)[67], Martin & Rubin (1995)[68], and McLain (2009) respectively.[69] The resistance to change scale was developed to observe the level of individuals' resistance to change by considering cognitive mechanisms behind the perceptions toward the change, a supporting tool for investigating the volatility dimension of "PVE". The intolerance of uncertainty scale was developed to observe the level of individuals' being intolerant of uncertainty by considering prospective anxiety (i.e., fear stimuli) behind the perceptions toward the change, a supporting tool for investigating the uncertainty dimension of "PVE". The cognitive flexibility scale was developed to observe the level of individuals' ability to deal with complicatedness by considering flexible thinking mechanisms behind the perceptions toward the more interrelated situations, a supporting tool for investigating the complexity dimension of "PVE". The tolerance of ambiguity scale was developed to observe the level of individuals' tolerance of dealing with ambiguities by considering behaviors and cognitive reactions behind the perceptions toward the more unfamiliar and insoluble situations, a supporting tool for investigating the ambiguity dimension of "PVE". The form of reviewing items whether adequate for measuring the "PVE" was sent to present expert reviews and included a pool of 52 items, presenting options such as "appropriate," "not appropriate," or "appropriate following revision to…". The analysis of the expert review form involved calculating a score (x: item, x>0.80) for each item based on the experts' review, which guided the researcher's decision to embed the item to the "PVE" scale. Following expert reviews pointing out the content validation, the refined item pool was formatted into a survey and presented to a selected group of respondents in a pilot study. Statistical analyses, including reliability and appropriateness to conduct factor analysis, were implemented based on the data obtained from the pilot study. Exploratory Factor Analysis (EFA) was then performed to investigate via SPSS 26.0 soft-

63 Worthington, R. L., & Whittaker, T. A. (2006). Scale development research: A content analysis and recommendations for best practices. The counseling psychologist, 34(6), 806-838.

64 Cohen R.J., Swerdlik M.E. (2010). Psychological testing and assessment. Boston: McGraw-Hill Companies.

65 DeVellis, R. F. (2017). Scale Development: Theory and Applications (4th ed.). Thousand Oaks, CA: Sage.

66 Oreg, S. (2006). Personality, context, and resistance to organizational change. European journal of work and organizational psychology, 15(1), 73-101.

67 Carleton, R. N., Norton, M. P. J., & Asmundson, G. J. (2007). Fearing the unknown: A short version of the Intolerance of Uncertainty Scale. Journal of anxiety disorders, 21(1), 105-117.

68 Martin, M. M., & Rubin, R. B. (1995). A new measure of cognitive flexibility. Psychological reports, 76(2), 623-626.

69 McLain, D. L. (2009). Evidence of the properties of an ambiguity tolerance measure: The multiple stimulus types ambiguity tolerance scale–II (MSTAT–II). Psychological reports, 105(3), 975-988.

ware whether the preliminary study of the "PVE" scale's factor structure can be in alignment with the VUCA itself, composed of four dimensions; volatility, uncertainty, complexity, and ambiguity. This EFA analysis involves exploring PVE's factor dimensions, the factor loadings of "PVE" items, and item-correlation results, while also considering any necessary reduction in the number of items in which factor loadings are less than .40 and the overlapping difference between factors is less than .20, covering the same item. After all these observations, the final version of the questionnaire was distributed to the general sample of the study. Subsequent data were used to observe the scale's construct validity (sample size >200) using CFA (Confirmatory Factor Analysis) through the AMOS 21 software. The scale's structural validity was examined based on the CFA model fit indices, culminating in the successful completion of the scale development study. Meanwhile, the descriptive statistics of the questionnaire responses by the general sample were examined and compared with the sample of a pilot study to observe respondents' mean responses to "PVE" items, whether reflect normal distribution and examine test-retest results. Afterward, observing the correlations among factors to validate the interconnected structure of the VUCA itself was asserted by Mack & Khare (2016) and Bennett & Lemoine (2014) who led a call for a research study to demonstrate these relationships through quantitative analysis.[41]

Sample

The scale development process is divided into two distinct groups: a pilot group (127 respondents) and the general sample (420 respondents). Researchers preferred to carry out a purposive sampling method which enables researchers to obtain more dedicated results validating questionnaire responses.[70] Within this regard, white-collar employees, minimum graduation of bachelor's degree, and being natives of European countries and the USA are the main elements for conducting a research study aiming to investigate and develop the "PVE" scale. The pilot study comprised 127 participants who were white-collar workers in the automotive manufacturing industry, with 62% being male and 38% female. Likewise, These employees were categorized into positions of specialist, chief, manager, and top managers role. Likewise, the general sample group of the study consisted of 420 white-collar employees (61% male, and 39% female) from the automotive manufacturing industry, also divided into specialist, chief, manager, and top manager roles. All participants graduated from university keeping degrees ranging from bachelor's to Ph.D., and are natives of European countries (i.e., France, Germany, UK) and the USA.

The PVE Scale Development Process

During the development of the "PVE" scale, all items from existing scales such as the 15-item "Resistance to Change" scale developed by Oreg (2006), the 12-item "Intolerance of Uncertainty" scale developed by Carleton et al. (2007), the 12-item "Cognitive Flexibility" scale developed by Martin & Rubin (1995), and the 13-item "Tolerance for Ambiguity" scale developed by McLain (2009) were incorporated into the study's item pool by the researcher without any preliminary screening. Primarily, the initial phase in this process is to evaluate the content validity of the items that have been developed, as emphasized by MacKenzie et al. (2011)[71] and Polites et al. (2012).[72] This evaluation encompasses two key aspects: first, determining the representativeness of the

70 Tongco MDC. 2007. Purposive sampling as a tool for informant selection. Ethnobotany Research & Applications 5:147-158.

71 MacKenzie, S. B., Podsakoff, P. M., & Podsakoff, N. P. (2011). Construct measurement and validation procedures in MIS and behavioral research: Integrating new and existing techniques. MIS Quarterly, 293-334.

72 Polites, G. L., Roberts, N., & Thatcher, J. (2012). Conceptualizing models using multidimensional constructs: a review and guidelines for their use. European Journal of Information Systems, 21, 22-48.

items, which involves confirming whether the items adequately cover various facets of the constructs under study. Second, it involves examining the comprehensiveness of the item sets, ensuring that, when taken together, they provide a complete representation of the construct in question. This approach is also supported by the work of MacKenzie et al. (2011) and Straub et al. (2004).[73] To obtain expert reviews, a survey form comprising a total of 52 items was generated, including options for each item such as "appropriate," "not appropriate," or "appropriate if revised to …." This form was then disseminated to a group of 7 lower-level (e.g., specialist role) to top-level managers (e.g., CEO) and 5 researchers active in the field of management for their input. Lower to upper-level managerial participants in the expert review phase were selected from European and US automotive manufacturers due to the scale being developed in English and aimed at employees possessing managerial roles in a competitive industry, thus reflecting the focus group. The other participating researchers, who conduct scientific activities in the field of management, publish only in English and continuously deliver courses and training in the English language as instructors. In the evaluation of responses, the content validity index (CVI), as suggested by sources such as Ayre & Scally (2014)[74] and Rubio et al. (2003),[75] was calculated for each item (initially) and then for each group of items (subsequently). Items that had a CVI lower than 0.80, following Ayre & Scally's (2014) criteria, were earmarked for either elimination or revision, based on any relevant qualitative feedback. This procedure led to the exclusion of 19 items and the rephrasing of 3 items. Consequently, through this item generation and refinement process, the final set of 33 items was considered to possess face validity and was therefore advanced for additional evaluation. Following the expert review phase, the questionnaire pool was reduced from 52 to 33 items because of considering the presence of similar questions related to the variable of interest, and the removal of items that could negatively affect the face validity of the scale. Also, the appropriateness to the perspective of the company-leader-employee triangle, and the creation of more comprehensible items to observe the perceived VUCA exposure can have a supportive role in reducing the item for maintaining clearance of understanding by respondents. These approaches were preferred by researchers and academic reviewers since the "perceived" notion has emphasized the cognitive mechanism of individuals affected by external stimulus, compared to "perception". Items accepted by experts have a range between 85-95% value, whereas items rejected by experts have a range of 25-35% value to ensure content validity.[75] These results indicate a significant degree of harmony in the reviews provided by the experts. After examining the content validity scores of expert review, Vol1 to Vol7 and Unc8 to Unc12 were decided by researchers to remove through both researcher and expert reviews. The developed "PVE" scale was organized by including a 6-point Likert-type scale. At this point, the primary factor in choosing the 6-point being considered by researchers is the perceptual and cognitive foundation of the subdimensions that constitute individuals' "PVE" and the requirement of discriminability from an observational standpoint.

73 Straub, D., Boudreau, M. C., & Gefen, D. (2004). Validation guidelines for IS positivist research. Communications of the Association for Information Systems, 13(1), 24.

74 Ayre, C., & Scally, A. J. (2014). Critical values for Lawshe's content validity ratio: revisiting the original methods of calculation. Measurement and evaluation in counseling and development, 47(1), 79-86.

75 Rubio, D. M., Berg-Weger, M., Tebb, S. S., Lee, E. S., & Rauch, S. (2003). Objectifying content validity: Conducting a content validity study in social work research. Social work research, 27(2), 94-104.

Results

The findings suggest that, generally, participants interpreted the items as they were meant to be understood. This lends credence to their face validity, a crucial aspect given the items' broad and abstract nature.[74] Additionally, by involving experts in the field during the preliminary testing phase, we also established content validity. Having developed the item pool, it is important to conduct a pre-test of a sample of the population to examine the psychometric properties of the proposed scale and conduct preliminary construct validity testing.[74] Thus, a questionnaire included the 33 items developed to measure the underlying dimensions of PVE, along with existing measures of conceptually similar constructs regarding; 5 items measuring volatility, 7 items measuring uncertainty, 11 items measuring complexity, and 11 items measuring ambiguity, was developed. All scale items were measured via a 6-point likert scale (ranging from 1=strongly disagree to 6=strongly agree). Following the expert review phase, the "PVE" scale was organized into 33 items and distributed to 127 white-collar employees (38% female, 62% male) who are managers continually serving in the automotive industry across European countries and the USA for its pilot study. The educational level of the participants was categorized as bachelor's degree (60%), master's degree (32%), and doctoral degree (8%). Moreover, when examining the generational groups of the participants, the majority were found to be from Generation Y (73%).

Table 1

The Demographic Structure of Pilot Study Respondents

Demographic Values	**Frequency**	**Percentage (%)**
Gender	127	100%
Female	*48*	*38%*
Male	*79*	*62%*
Education Degree	127	100%
Bachelor's Degree	*76*	*60%*
Master's Degree	*40*	*31%*
Ph.D.	*11*	*9%*
Age Interval	127	100%
18-28	*19*	*16%*
28-40	*82*	*64%*
40-55	*26*	*20%*
Job Position	127	100%
Specialist	*64*	*50%*
Chief	*32*	*25%*
Manager	*21*	*17%*
Executive (C-Level)	*10*	*8%*

According to Tabachnick & Fidel (2007), the results of the pilot study indicated that the preliminary scale had a normal distribution (within the range of -1.5 to +1.5)[76] and that the reliability of the scale was significant (α= 0.847), as seen in Table 1. The average response for items related to volatility & uncertainty ranging from 2.4 to 3.9 and items related to complexity & ambiguity ranging from 3.1 to 4.4 depicted a considerably high level of the PVE. The suitability of the scale for factor analysis, in preparation for conducting an EFA, was confirmed through significant Kaiser-Meyer-Olkin (KMO) measure (.927) and Bartlett's Test of Sphericity (χ^2=7681.790; df=528; p-value< .05).

76 Tabachnick, B. G., & Fidell, L. S. (2007). Experimental designs using ANOVA (Vol. 724). Belmont, CA: Thomson/Brooks/Cole.

Table 2

The Item Statistics of the Pilot Study

Item	Mean	Skewness	Kurtosis	Item	Mean	Skewness	Kurtosis
VOL1	*2.51*	*-.203*	*-.587*	*COM6*	*4.14*	*-.515*	*-.082*
VOL2	*2.40*	*-.028*	*-.655*	*COM7*	*4.40*	*-.472*	*-.569*
VOL3	*2.97*	*-.309*	*-.073*	*COM8*	*3.85*	*-.396*	*-.529*
VOL4	*2.45*	*-.001*	*-.211*	*COM9*	*4.24*	*-.236*	*-.953*
VOL5	*2.64*	*-.066*	*-.443*	*COM10*	*4.33*	*-.369*	*-.909*
UNC1	*3.40*	*-.280*	*-.970*	*COM11*	*4.01*	*-.419*	*-.389*
UNC2	*3.52*	*.145*	*-.550*	*AMB1*	*3.49*	*-.262*	*-.671*
UNC3	*3.46*	*.114*	*-.539*	*AMB2*	*4.02*	*-.349*	*-.409*
UNC4	*2.85*	*.455*	*-.089*	*AMB3*	*3.37*	*-.165*	*-.792*
UNC5	*3.61*	*-.794*	*.521*	*AMB4*	*3.15*	*.039*	*-1.074*
UNC6	*2.73*	*-.632*	*.676*	*AMB5*	*3.90*	*-.366*	*.307*
UNC7	*3.95*	*-.558*	*1.569*	*AMB6*	*3.44*	*-.193*	*-.600*
COM1	*4,08*	*-.421*	*-.280*	*AMB7*	*3.58*	*-.306*	*-.301*
COM2	*4.02*	*-.798*	*.059*	*AMB8*	*3.81*	*-.482*	*.861*
COM3	*4.42*	*-1.032*	*.741*	*AMB9*	*3.44*	*-.207*	*-.500*
COM4	*4.00*	*-.530*	*.014*	*AMB10*	*3.29*	*-.114*	*-.986*
COM5	*3.95*	*-.244*	*-.708*	*AMB11*	*3.57*	*-.019*	*-1.010*

The EFA technique was employed by researchers to observe the factor structure of the "PVE" scale. Within this method, decisions are made mostly based on factor loadings and eigenvalues. The obtained values are compared with the scree plot graph to provide insights into the final factor structure. Items exhibiting factor loadings below 0.50, as advised by Hair et al. (2017), and those with cross-loadings exceeding 0.40 were methodically eliminated.[77] This led to the emergence of a distinct 4-factor structure. Consequently, through the processes of data reduction and the identification of dimensions, a final solution was reached, comprising 25 items that effectively measured four distinct factors. According to Table 3, the "PVE" scale covered four factors—Volatility, Uncertainty, Complexity, and Ambiguity—accounting for 67.288% of the explained variance being compatible with the suggestion by Molina et al, (2007) (% of variance explained should greater than 50%).[78] In this EFA technique, maximum likelihood and direct oblimin techniques were utilized. After examining the "PVE" scale's pattern matrix and item-total correlation values, items "Unc7", "Com2", "Com3", "Com6", "Com10", "Amb4", "Amb5", "Amb8", "Amb9", and "Amb10" were removed from the scale due to their low factor loadings (< .50) and low item-total score correlations (> .60). Consequently, the "PVE" scale was presented to the general sample as 4 sub-dimensions with 25 items. Each factor's percentage of variance explained more than 5% of variance, and cumulatively, the difference in variance between them was also over 5%. This result indicated no overlap between factors and that different items possessed explanatory qualities. Eigenvalues significantly greater than 1 express that each factor encompasses distinct explanatory items. Factor-item loadings greater than .70 indicate that the current items are appropriately aligned with the scale's structure within a factor context. Following the pilot study, the scale's factor structure was reassessed, and as indicated in Table 1, it is understood to have a normal distribution (<.05) and represents significantly valid reliability. Moreover, the correlation of the factors with the overall

77 Hair Jr, J. F., Matthews, L. M., Matthews, R. L., & Sarstedt, M. (2017). PLS-SEM or CB-SEM: updated guidelines on which method to use. International Journal of Multivariate Data Analysis, 1(2), 107-123.

78 Molina, A., Martín-Consuegra, D., & Esteban, A. (2007). Relational benefits and customer satisfaction in retail banking. International journal of bank marketing, 25(4), 253-271.

scale was found to be significant (<.05), and a positive significant relationship was observed between volatility and uncertainty (r= .417), as well as between complexity and ambiguity (r= .451)

Table 3

Exploring the Factor Structure

Perceived VUCA Exposure Scale (*Factor-Items*)	Factor Load	Eigenvalue	% of Variance
Volatility		8.741	34.965
I believed that the change would harm the way things are done in the organization.	.912		
I thought that it's a negative thing that we were going through this change	.870		
I believed that the change would make my job harder	.804		
*I believed that the change would benefit the organization**	.832		
*I believed that I could personally benefit from the change**	.854		
Uncertainty		3.810	15.241
Unforeseen events upset me greatly	.746		
It frustrates me not having all the information I need	.763		
One should always look ahead to avoid surprises	.746		
A small, unforeseen event can spoil everything, even with the best of planning	.804		
I always want to know what the future has in store for me.	.792		
I can't stand being taken by surprise.	.775		
Complexity		2.432	9.729
I can communicate an idea in many different ways.	.867		
In any given situation, I can act appropriately.	.838		
I can find workable solutions to seemingly unsolvable problems	.740		
I am willing to work at creative solutions to problems.	.726		
My behavior is a result of conscious decisions that I make	.766		
I have many possible ways of behaving in any given situation.	.778		
I am willing to listen and consider alternatives for handling a problem.	.772		
Ambiguity		1.838	7.354
I do not tolerate ambiguous situations well*	.907		
I would rather avoid solving a problem that must be viewed from several different perspectives*	.825		
I try to avoid ambiguous situations*	.737		
I avoid situations that are too complicated for me to easily understand*	.769		
I am tolerant of ambiguous situations	.838		
I dislike ambiguous situations*	.748		
I find it hard to make a choice when the outcome is uncertain*	.733		
Total % of Variances Explained:			67.288

*: *The item has a reverse-coded style.*

The "PVE" scale had reverse-coded items which provided accurate results in case of possible misunderstandings by respondents. Factor loadings were differentiated between .726 in minimum and .912 in maximum value depicting the appropriateness of factor structure, as seen in Table 3. The volatility dimension has five items, the uncertainty dimension has six items, and the complexity and ambiguity dimension has seven items.

Table 4

The Descriptive Statistics of the Final Study

Item	Mean	Skewness	Kurtosis	Item	Mean	Skew-ness	Kurtosis
VOL1	*2.51*	*-.203*	*-.587*	*COM3*	*3.95*	*-.244*	*-.708*
VOL2	*2.40*	*-.028*	*-.655*	*COM4*	*4.14*	*-.515*	*-.082*
VOL3	*2.97*	*-.309*	*-.073*	*COM5*	*4.40*	*-.472*	*-.569*
VOL4	*2.45*	*-.001*	*-.211*	*COM6*	*3.85*	*-.396*	*-.529*
VOL5	*2.64*	*-.066*	*-.443*	*COM7*	*4.33*	*-.369*	*-.909*
UNC1	*3.40*	*-.280*	*-.970*	*AMB1*	*3.49*	*-.262*	*-.671*
UNC2	*3.52*	*.145*	*-.550*	*AMB2*	*4.02*	*-.349*	*-.409*
UNC3	*3.46*	*.114*	*-.539*	*AMB3*	*3.37*	*-.165*	*-.792*
UNC4	*2.85*	*.455*	*-.089*	*AMB4*	*3.90*	*-.366*	*.307*
UNC5	*3.61*	*-.794*	*.521*	*AMB5*	*3.44*	*-.193*	*-.600*
UNC6	*2.73*	*-.632*	*.676*	*AMB6*	*3.29*	*-.114*	*-.986*
COM1	*4.08*	*-.421*	*-.280*	*AMB7*	*3.57*	*-.019*	*-1.010*
COM2	*4.00*	*-.530*	*.014*				

The final scale with a general sample (n: 420) had a normal distribution (skewness: -.794, kurtosis: .676) and the reliability of the scale was significant (α= .884), as seen in Table 4. The average response for items related to volatility & uncertainty ranging from 2.40 to 3.61 and items related to complexity & ambiguity ranging from 3.29 to 4.40 depicted a considerably high level of the PVE.

Table 5

The Demographic Structure of Final Study Respondents

Demographic Values		Frequency	Percentage (%)
Gender		420	100%
	Female	*164*	*39%*
	Male	*256*	*61%*
Education Degree		420	100%
	Bachelor's Degree	*223*	*53%*
	Master's Degree	*143*	*34%*
	Ph.D.	*54*	*12%*
Age Interval		420	100%
	18-28	*71*	*17%*
	28-40	*189*	*45%*
	40-55	*160*	*38%*
Job Position		420	100%
	Specialist	*235*	*56%*
	Chief	*101*	*24%*
	Manager	*67*	*16%*
	Executive (C-Level)	*17*	*4%*

The "PVE" scale was organized into 25 items and distributed to 420 white-collar employees (39% female, 61% male) who are managers continually serving in the automotive industry across European countries and the USA for its final study. The educational level of the participants was categorized as bachelor's degree (53%), master's degree (34%), and doctoral degree (12%). Moreover, when examining the generational groups of the participants, the majority were found to be from Generation Y (45%).

Table 6

The Construct Validity with CFA Analysis

Scale	CMIN\df	CFI	GFI	NFI	RMSEA
The Perceived VUCA Exposure (PVE)	**1.337**	**0.987**	**0.965**	**0.974**	**0.032**

CFA enables researchers to evaluate the robustness and model fit. To validate the two-factor structure of the scale, a Confirmatory Factor Analysis (CFA) was conducted. Kline (2005) posited that a ratio of χ^2 to degrees of freedom (df) of 3 or less indicates excellent fit in large samples.[79] Additionally, Hu & Bentler (1998) suggested that values of Root Mean Square Error of Approximation (RMSEA) at or below 0.06 and Standardized Root Mean Square Residual (SRMR) at or below 0.08 are indicative of a good fit.[80] Byrne (2013) articulated that values of 0.90 or higher for the Goodness of Fit Index (GFI), Adjusted Goodness of Fit Index (AGFI), Comparative Fit Index (CFI), and Normed Fit Index (NFI) represent an acceptable fit.[81] The authors performed CFA through AMOS v.25. The chi-square (x^2) to the degree of freedom indicated a value of 1.722 that meets Bagozzi and Yi's (1989) and Byrne's (2013) ideal values of less than 3 and 2, respectively.[82] The RMSEA indicated a value of 0.032 and complied with Hair et al.'s (2010) maximum suggested value of 0.08.[83] Similarly, the calculated SRMR value of 0.0295 proposed the close fit of the model since it efficiently relates to Hu & Bentler's (1998) recommended value of less than 0.1. The other model fit indices values, such as GFI, NFI, and CFI were also found just close to the recommended value. The details of these indices are given in Table 6. Considering the results of these model-fit indices, it can be said that the studied model indicated an admirable fit to the data.

Table 7

The PVE's Descriptive Statistics and Factor Correlations

Sub-Factors	Mean	Skewness	Kurtosis	Cronbach's Alpha (α)	(1)	(2)	(3)	(4)
Volatility (1)	2.59	-.194	-.670	.918		.417**	-.376**	-.425**
Uncertainty (2)	3.36	-.134	.231	.856			-.394**	-.364**
Complexity (3)	4.88	-.623	-.467	.902				.451**
Ambiguity (4)	3.47	-.226	-.520	.884				

The reliability coefficient, which pertains to the extent to which a test accurately measures the characteristic it intends to measure, is generally considered sufficient for a psychological test if it is 0.70 or higher (Creswell & Creswell, 2017). To determine the reliability of the "PVE" scale, the internal consistency coefficient (cronbach's alpha) was calculated. In this study, the cronbach's alpha values were found to be 0.92 for volatility, 0.86 for uncertainty, .90 for complexity, 0.88 for ambiguity, and 0.884 for the overall "PVE "scale. These values indicate a high reliability of the items on the scale and their consistency in measuring the "PVE" scale developed by re-

79 Kline, T. J. (2005). Psychological testing: A practical approach to design and evaluation. Sage Publications.

80 Hu, L. T., & Bentler, P. M. (1998). Fit indices in covariance structure modeling: Sensitivity to under parameterized model misspecification. Psychological methods, 3(4), 424.

81 Byrne, B. M. (2013). Structural equation modeling with Mplus: Basic concepts, applications, and programming. Routledge.

82 Bagozzi, R. P., & Yi, Y. (1988). On the evaluation of structural equation models. Journal of the academy of marketing science, 16, 74-94.

83 Hair Jr, J. F., Babin, B. J., & Anderson, R. E. (2010). A global perspective. Kennesaw: Kennesaw State University.

searchers.

According to Table 7, the correlations among VUCA dimensions (volatility, uncertainty, complexity, ambiguity) have a significantly moderate relationship. The volatility is significantly correlated with uncertainty (r: 0.417), complexity (r: -0.376), and ambiguity (r: -0.425) respectively. The uncertainty is significantly correlated with complexity (r: -0.394), and ambiguity (-0.364). The complexity is significantly correlated with ambiguity (r: 0.451).

Convergent validity assesses the degree to which elements within a measure have significant reliability (a=0.884). This validity is reflected in the factor loadings of constructs. Gaskin & Happell (2014) suggest that an ideal average loading for each construct should exceed 0.70.[84] As presented in Table 3, the mean loading for all dimensions (volatility, uncertainty, complexity, ambiguity) surpasses this threshold, confirming the presence of convergent validity in this context. Therefore, convergent validity is established, with further details available in Table 3.

On the other hand, discriminant validity is determined by the extent to which variables are distinct from each other. This validity is based on the expectation that variables should be more strongly related to their respective factors than to others. As per guidelines by Khan & Jan (2019), correlations between variables should not exceed 0.70.[85] The factor correlation matrix in Table 8 clearly illustrates that none of the inter-construct correlation values exceed this limit, indicating a lack of strong correlation between the variables. This observation confirms that discriminant validity has been successfully achieved.

Lastly, to ensure the reliability of the scale independently from the sample, a test-retest analysis was conducted through data obtained by the pilot and general study respondents[93]. The test-retest analysis indicated that the "PVE" scale is valid independently from the sample, with a significant correlation (r: 0.894).

The calculation of the "PVE" scale is the total sum of volatility and uncertainty, minus complexity and ambiguity, in mathematical wording (V+U-C-A). The result of high "PVE" represents that the employee or individual is remarkably affected by VUCA factors to a perceptual extent.

The "PVE" scale, developed within the scope of the above-mentioned analysis to carry out the scale development process, has been significantly validated for its application in subsequent research through examination and observations in line with the recommendations of DeVellis (2017).

Discussion

According to Bennett & Lemoine (2014), the VUCA structure has an observable relationship among its factors (volatility, uncertainty, complexity, and ambiguity), as the results of the "PVE" scale development process validated through content validity, internal consistency, construct investigation, and construct validity maintained by researchers. Since the VUCA structure is originally new and still being experienced by business environments

84 Gaskin, C. J., & Happell, B. (2014). On exploratory factor analysis: A review of recent evidence, an assessment of current practice, and recommendations for future use. International journal of nursing studies, 51(3), 511-521.

85 Khan, M. F., & Jan, A. (2019). A measure of social media marketing: Scale development and validation. Jindal Journal of Business Research, 8(2), 158-168.

and employees, its empirical study has not been investigated via quantitative research methods[86] by researchers suggesting to examination of VUCA factors through perception-basis instruments[87]. To this end, each VUCA factor was explored by pointing out perception-based items nurtured by the cognitive mechanism of individuals in this research study, and the findings illustrate a significant moderate effect among the VUCA factors composing the individuals' "PVE" levels in general. Because change can cause uncertainty, volatility, and uncertainty have a significant correlation where the emergence of innovations often and the consequences are not predicted.[88]

"Volatility" and "Uncertainty" exhibit a significant correlation, as fluctuations often engender uncertainties. This is particularly evident in the realm of innovations, where the ramifications of such developments are frequently unpredictable. Likewise, there is a notable correlation between "Uncertainty" and "Complexity". This relationship is primarily attributed to the phenomenon of 'intolerance of uncertainty', which reflects a form of cognitive inflexibility. This rigidity hinders employees' ability to adapt effectively to the outcomes of unforeseen events. Furthermore, "Complexity" and "Ambiguity" are interrelated. Ambiguity necessitates adaptable cognitive strategies for successfully navigating its impacts, which often involves considering various potential future scenarios. The interconnectedness of complexity with both uncertainty and ambiguity, as characterized by similar features, is highlighted by Mack & Khare (2016). They assert that complexity is a pivotal element that precipitates environments marked by both uncertainty and volatility, culminating in ambiguity. This is particularly relevant in the context of decision-making from a determined system perspective.

On the other hand, the VUCA factors can be delineated into two interconnected categories based on the temporal scope of their impact. The VUCA framework, as expounded by Bennett & Lemoine (2014), distinguishes two dimensions within the VUCA construct that pertain to prediction and knowledge. The factors of "Volatility" and "Uncertainty" primarily function as both the drivers and consequences of contemporary unforeseen events, influencing current practices, strategies, and characteristics of organizations or individuals. In contrast, "Complexity" and "Ambiguity" are chiefly agents that transition organizations or individuals into scenarios necessitating navigation through more profound VUCA impacts. These effects are inherently unpredictable and unknown due to their future-oriented nature.

Thus, these factors can be categorized as "the outcomes of today's actualized realities" and "the outcomes of tomorrow's potential realities." Kail (2010) illustrates this postulation through the aftermath of the 9/11 attacks. The repercussions of these attacks, which engendered uncertainties like ensuring security, sustaining international relations, and managing financial crises, were compounded by significant volatilities, such as structural and organizational shifts, political inconsistencies, and market fluctuations. These are indicative of "the outcomes of today's actualized realities,"[89] which foster a chaotic environment within the VUCA framework.

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86 Saleh, A., & Watson, R. (2017). Business excellence in a volatile, uncertain, complex, and ambiguous environment (BEVUCA). The TQM Journal, 29 (5), 705–724.

87 Fridgeirsson, T. V., Kristjansdottir, B. H., & Ingason, H. T. (2021). An Alternative Risk Assessment Routine for Decision Making; Towards a VUCA Meter to Assess the Volatility, Uncertainty, Complexity, and Ambiguity of Complex Projects. In Research on Project, Programme and Portfolio Management (pp. 41-54). Springer, Cham.

88 Codreanu, A. (2016). A VUCA action framework for a VUCA environment. Leadership challenges and solutions. Journal of Defense Resources Management (JoDRM), 7(2), 31-38.

89 Doner, E. (2022). The "Vuca" Effects & Product Innovation Performance at Turkish Global Bus & Coach Industry. Akademisyen Kitabevi.

Conversely, as per Kail (2010), the group embodying "the outcomes of tomorrow's potential realities"[89] is highlighted by the context of ambiguity, characterized as the inability to accurately conceptualize threats and opportunities before they become critical.[90] This is further complicated by complexities such as interconnectivity, the proliferation of variables, and unforeseen constraints. This category underscores the unpredictable and unknown facets of the future within the VUCA framework.

Conclusion

Consciously aware of employees' perceived exposure to VUCA provides leaders with the opportunity to better assess the current state of the organization. This capability enables them to be more flexible and prepared in response to changing market conditions and unexpected situations. VUCA can make decision-making in uncertain and complex situations more challenging. By comprehending these employee perceptions. leaders can develop more effective decision-making processes. The perceptions of VUCA among employees play a critical role in the development of risk management strategies. Leaders can create more effective risk assessment and management processes by considering these perceptions. Being flexible and adaptable in a VUCA world is of vital importance. Leaders can make more informed decisions regarding the adaptation of organizational structures and processes in response to employee perceptions. Understanding and developing strategies to mitigate employees' VUCA perceptions can enhance their engagement and motivation at work. Perceptions of VUCA can be a significant indicator in identifying training and development needs. aiding in the design of more effective training content and development programs. Employees' perceptions of VUCA can impact their ability to adapt to change. Understanding employees' VUCA perceptions can help in enhancing their engagement and retention. The VUCA environment can either stimulate or hinder engagement. depending on how it's perceived and managed. Employees' perceptions of VUCA can influence how they identify and manage risks. As per a study by Mack & Khare (2016), companies that effectively manage the challenges of a VUCA world can create a culture of innovation. as employees learn to work creatively within an unpredictable and complex environment.[91] Understanding how employees perceive VUCA conditions can guide the development of leadership programs. Traditional leadership development methods are insufficient in a VUCA world and it could be suggested that new approaches that include understanding the workforce's perception are necessary. Measuring and understanding employees' perceived VUCA levels helps leaders and organizations to adapt, thrive, and maintain a competitive edge in an increasingly complex and unpredictable business world. Hence, Doner's (2020) master's thesis endeavored to propose a conceptual framework for understanding the perceptions of employees in the bus and coach manufacturing industry regarding VUCA (Volatility, Uncertainty, Complexity, and Ambiguity) factors.[92] Moreover, this research study has served as a source of inspiration for researchers, prompting investigations into the observation of VUCA phenomena using quantitative research methodologies, as of the year 2020. Additionally, it forms the foundational impetus for the development of the "PVE" scale. Further studies should be implemented through replication of scale through different industries (e.g., health services, finance, tourism). Also, it can be more beneficial to explore

90 Kail, E. G. (2010). Leading in a VUCA environment: C is for complexity. Harvard Business Review. December, 3.

91 Mack, O., & Khare, A. (2016). Perspectives on a VUCA World. Managing in a VUCA World, 3-19.

92 Doner, E. (2020). Investigating the Effects of the "VUCA" Factors on Product Innovation Performance at Turkish Bus & Coach Industry, p.40. [Master Thesis, Alparslan Türkeş University]Eapen, G. (2009). Flexibility: flexible companies for the uncertain world. CRC Press.

individuals' and employees' responses toward VUCA by examining relationships between behavioral contexts, such as emotional intelligence, motivation, and psychological assessments.

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APPENDIX I: The "Perceived VUCA Exposure" Scale

Perceived VUCA Exposure Scale	**1 Strongly Disagree**	**2 Disagree**	**3 Slightly Disagree**	**4 Slightly Agree**	**5 Agree**	**6 Strongly Agree**
Volatility						
I believed that the change would harm the way things are done in the organization.						
I thought that it's a negative thing that we were going through this change						
I believed that the change would make my job harder						
*I believed that the change would benefit the organization**						
*I believed that I could personally benefit from the change**						
Uncertainty						
Unforeseen events upset me greatly						
It frustrates me not having all the information I need						
One should always look ahead to avoid surprises						
A small, unforeseen event can spoil everything, even with the best of planning						
I always want to know what the future has in store for me.						
I can't stand being taken by surprise.						
Complexity						
I can communicate an idea in many different ways.						
In any given situation, I can act appropriately.						
I can find workable solutions to seemingly unsolvable problems						
I am willing to work at creative solutions to problems.						
My behavior is a result of conscious decisions that I make						
I have many possible ways of behaving in any given situation.						
I am willing to listen and consider alternatives for handling a problem.						
Ambiguity						
I do not tolerate ambiguous situations well*						
I would rather avoid solving a problem that must be viewed from several different perspectives*						
I try to avoid ambiguous situations*						
I avoid situations that are too complicated for me to easily understand*						
I am tolerant of ambiguous situations						
I dislike ambiguous situations*						
I find it hard to make a choice when the outcome is uncertain*						

**item is reverse coded.*