

## IT ADAPTABILITY ROLE IN SHAPING ORGANIZATIONAL PERFORMANCE IN VUCA ENVIRONMENT

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**Purpose:** The aim of this research is to verify whether the characteristics of the environment are strengthening the influence of IT adaptability on organizational performance.

**Design/methodology/approach:** In order to verify the potential relations, empirical studies were conducted in 1160 organizations located in Poland, Italy, and the USA. The CAWI method was used in this research, while the companies were selected on the basis of the purposive manner. The reliability of the scales used in the survey was tested and afterwards the moderation model was built, confirming the presumed relationships between the variables.

**Findings:** It has been proven that the more VUCA the environment is, the stronger the influence of IT adaptability on organizational performance.

**Research limitations/implications:** The limitations of the research include: performing analyzes only in three countries, purposeful sampling, data collection period, and the application of selected constructs to the model. The future studies proposals included in the article are aimed at reducing cognitive space.

**Practical implications:** Research results can support organizational managers who, by ensuring IT with appropriate characteristics (such as IT adaptability), are able to enhance organizational performance in turbulent and difficult environmental conditions.

**Originality/value:** The research enriches existing knowledge in the field of organizational performance. Including the issue of IT adaptability in considerations in this area allows for providing support to organizations operating in conditions of uncertainty.

**Keywords:** management, IT adaptability, VUCA environment, crisis management, black swan event, organizational performance.

**Category of the paper:** Research paper.

## 1. Introduction

Existing theories in the area of organization management, such as Resource-Based View (RBV) or extended Knowledge-Based View (KBV), although they are very well embedded in the literature, seem to insufficiently describe the current global situation (Zhang-Zhang et al., 2022). Turbulent environmental conditions, high level of uncertainty, threats to ensuring business continuity and diversity, intensity, and rapidity of occurring phenomena have resulted in an increase in interest in the VUCA concept (Ciolacu et al., 2023; Rimita et al., 2020). Volatility, uncertainty, complexity, and ambiguity (VUCA) are features of the modern reality in which operating organizations must use various activities in order to survive. Changes have become the new constant, and adapting to them has become the main challenge faced by managers of organizations (Du, Chen, 2018). Emerging crises or even black swan phenomena, which not only affect entire societies, but also interrupt the existing activities of entities on the market, should be not forgotten (Bieńkowska et al., 2022; Zabłocka-Kluczka, Salamacha, 2023). One of the opportunities to cope with such difficult conditions seems to be the use of advanced technologies to support organizational activities, including widespread digitization and the use of IT tools (Caporuscio et al., 2023). Numerous researchers have investigated the important role of utilize digital technologies in building organizational resilience and overcoming challenges in the VUCA reality (Khalil et al., 2022; Khurana et al., 2022; Strotmann et al., 2022). It seems, however, that despite the good recognition of this issue, not all aspects have been explored. The ability of IT to adapt to changes, so important due to the lack of stability of the environment, is still underrepresented. Bernardi (2023) in research on the implementation of innovative telehealth solutions during the crisis caused by the Covid pandemic, showed the benefits that resulted from IT adaptability to ensure public safety. The author indicated that this is an area around which the interest of researchers should focus. Zia et al. (2023) seem to agree with this statement. The authors indicated the impact of digital dynamic capabilities (which include IT adaptability) on the success or failure of the organization. Researchers believe that this is an appropriate direction for further research, as many factors remain unrecognized. Therefore, the research gap was identified.

Bearing in mind the above the aim of the paper is to verify whether the characteristics of the environment are strengthening the influence of IT adaptability on organizational performance. The aim will be fulfilled by critical literature analysis, which will be a basis for hypotheses development and by empirical research aimed at verification of the hypotheses.

## 2. Theoretical background

### 2.1. VUCA environment

In today's rapidly changing world, the concept of VUCA—Volatility, Uncertainty, Complexity, and Ambiguity—has become increasingly pertinent in the field of organizational management and strategic planning. Initially introduced by the U.S. military (U.S. Army..., 2022), it later transitioned into the business world and is now used to describe the unpredictable nature of the global business environment (Bennett, Lemoine, 2014). VUCA provides a framework for comprehending and addressing the challenges caused by an unpredictable and turbulent environment. The framework emphasizes four key components, which have distinct characteristics:

**Volatility:** This refers to the speed and magnitude of change, encompassing unpredicted and frequent shifts in market conditions (Bennett, Lemoine, 2014), technology advancements (Hall, Rowland, 2016), and global events that can disrupt systems and norms (van der Wal, 2017).

**Uncertainty:** Uncertainty relates to the lack of predictability in numerous future events (Gläser, 2023), often attributed to the lack of information on whether the event will have meaningful consequences (Bennett, Lemoine, 2014), making it challenging for organizations to anticipate outcomes or trends accurately.

**Complexity:** Complexity signifies the intricacy and interconnectivity of issues and factors that influence decision-making, which are hard to understand (van der Wal, 2017) and require a holistic perspective to recognize the multifaceted nature of challenges.

**Ambiguity:** Ambiguity deals with the blurred lines of cause and effect, making it difficult to discern patterns and make clear, straightforward decisions due to the lack of prior examples and relevant historical data (Bennett, Lemoine, 2014). Moreover, ambiguity interferes with the company's ability to learn from such events (Garud et al., 2011).

Some scholars refer to VUCA not regarding the general organizational environment but in terms of the specific business process or activity. In particular, (Raghuram et al., 2023) are addressing “the volatility in supplies, uncertainty in demand, complexity in getting the product and ambiguity in understanding the issues” for a biomedical manufacturer.

Today, the main events defining the VUCA context and considered by scholars are the COVID-19 pandemic (Zhang-Zhang et al., 2022), significant economic downturns, disrupted supply chains, deglobalization, Russian aggression in Ukraine (Mahajan, Baride, 2023), technology-intensive conditions. Outlining the extreme dynamics of the modern VUCA world (Peschl, 2023) due to the simultaneous multi-level crisis events (Zhang-Zhang et al., 2022), authors are thriving to suggest the appropriate way to create impactful and sustainable innovations in such conditions by learning from the future (Peschl, 2023) introducing advanced

digital technologies to manage supply chains (Akyuz, Gursoy, 2020), transforming leadership styles (Amin et al., 2019), real-time data processing (Lechler et al., 2019).

Researchers recognize that VUCA is not confined to a single sector or industry. It transcends boundaries and affects various contexts. Therefore, scholars investigate managerial approaches and ways to successfully operate in such an environment across industries, e.g., in the energy sector (Giones et al., 2019), agriculture (Germundssona et al., 2021) public services (Gaule et al., 2023). Strategies for navigating VUCA are being developed for different organization sizes. Agility is of strategic importance for SMEs, and its three precursors include capabilities of digital technologies, relationships, and innovations (Troise et al., 2022). Shams et al. (2021) view strategic agility, including supply chain agility, IT agility and sustainable and agile production, as a crucial strategic approach for multinationals.

In conclusion, the VUCA framework provides a valuable lens through which to view the challenges and opportunities presented by our ever-changing world. Organizations across different sectors need to acknowledge the VUCA environment and implement strategies that enable them to thrive amidst volatility, uncertainty, complexity, and ambiguity. In a VUCA world, adaptability, innovation, and strong leadership are the cornerstones of success, and organizations that embrace these principles are better equipped to excel in an unpredictable future.

## **2.2. IT adaptability**

In the twenty-first century, organizations faced increasingly uncertain and rapidly changing conditions. Even before the emergence of the COVID-19 pandemic, which multiplied those characteristics, adaptation was perceived by various scholars as fundamental for the survival and success of the organization (Baard et al., 2014; Marques-Quinteiro et al., 2018).

Moreover, adaptability was considered by scholars as one of the four characteristics of organizations that shape their resilience. According to (Vogus, Sutcliffe, 2007), adaptability, preparedness, responsiveness, and learning are drivers of organizational resilience, defined as "the maintenance of positive adjustment under challenging conditions such that the organization emerges from those conditions strengthened and more resourceful". Various authors consider adaptability as the most important driver of resilience, allowing organizations to recover from crises (Koronis, Ponis, 2018).

Adaptability is a characteristic that may be used to describe various elements of an organization. The common understanding for all of them is placing adaptability as a characteristic connected to the ability to easily change (Almutairi, Ghandour, 2021). In the context of organization, adaptability is defined as an organization's capacity to continuously change its strategy and competencies in response to environmental conditions (Albaum, Tse, 2001).

Adaptability of IT should be treated as a derivative of such understanding, as IT is considered an element of organization from the management sciences perspective (Beynon-Davies, 2013). IT adaptability is crucial in supporting the organization's operations in a VUCA environment.

The notion of IT in the organization has been analyzed in two primary research areas: IT-business alignment and IT dynamic capabilities. These areas emphasize the need for IT to adapt and support the organization in turbulent conditions (Heart et al., 2010).

At the center of all this research are three characteristics/capabilities of IT known as the three AAA – agility, alignment, and adaptability (Patrucco, Kähkönen, 2021). These concepts are essential in the post-COVID-19 era, where agility involves responding to short-term changes, alignment focuses on matching organizational needs with IT capabilities, and adaptability centers on adapting to both short-term and long-term changes.

IT adaptability is a broad notion originating from the ISO/IEC 25010 norm, defining it as "the degree to which a product or system can effectively and efficiently be adapted for different or evolving hardware, software, or other operational or usage environments" (ISO/IEC25010:2011, 2011). IT adaptability is critical in accommodating changes in user requirements or the environment (Almutairi, Ghandour, 2021).

IT adaptability encompasses both system-based and organization-based aspects (Ngo-Ye, Ahsan, 2005). The system-based perspective focuses on IT's inherent qualities, such as scalability, modularity, and interoperability, while the organization-based perspective pertains to how IT is used within an organization and its adaptability in specific circumstances.

To address the gaps in research on IT adaptability in organizations, it is essential to consider the adaptability of IT within the context of an organization's specific needs and usage patterns. This perspective underscores the need for a mechanism that allows organizations to benefit from adaptable IT and support its proper use.

Some immanent qualities of IT itself are associated with IT adaptability, both system-based (scalability, modularity, independence, interoperability, self-organization, design, self-similarity, availability) and organization-based (structural analogy, knowledge, redundancy, customizing) (Groenewald, Okanga, 2019). Decisions regarding the deployment of IT systems within a business organization significantly influence the degree of adaptability that can be achieved (Gronau, Rohloff, 2007).

While various authors have explored IT adaptability in the context of organizations, the coverage of this field of study remains relatively limited (Liu et al., 2019). Understanding IT adaptability requires considering both the phase of developing new IT systems and their adaptability, as well as how IT is used within an organization over time (Boland, Hirschheim, 1987).

In conclusion, adaptability is a crucial attribute for organizations to thrive in a rapidly changing world. IT adaptability, as a subset of this concept, plays a pivotal role in enabling organizations to respond effectively to evolving conditions and crises. The study of

IT adaptability encompasses system-based and organization-based aspects, highlighting the need for IT to not only possess inherent adaptable qualities but also to be utilized effectively within the organization's specific context. Further research is needed to deepen our understanding of IT adaptability and its impact on organizational resilience and performance.

### **2.3. IT adaptability and organizational performance**

The relationship between IT adaptability and organizational performance, particularly in the context of environment characteristics, is a subject of increasing importance in the literature. The core idea is that adaptability, in the context of the entire organization, plays a significant role in influencing overall performance. This concept is structured as follows: the context affects adaptability, which, in turn, influences behaviors, ultimately shaping organizational performance. This framework is crucial in developing models that examine the influence of a specific type of adaptability, IT adaptability, on the entire organization (Tworek, 2023).

The literature often references the IS Success Model (DeLone, McLean, 2003), which includes IT resources, IT capabilities, and IT-business alignment (Jacks et al., 2011), all of which can mitigate adverse effects on an organization's performance. Various studies have supported the idea that adaptable IT positively impacts organizational performance (Darvishmotevali, Ali, 2020; Wanasida et al., 2021). Adaptable IT supports the implementation of strategies and facilitates quick decision-making (Stank, Lackey, 1997), making it a critical factor during crises. IT adaptability also connects to organizational sustainability, indirectly influencing performance (Zeng, Lu, 2021), even during crises.

The literature discusses the role of IT adaptability in influencing organizational performance through job performance (Tworek, 2023). Adaptable IT enables employees to perform their tasks effectively, especially in VUCA environment. It supports task redesign, a necessity in VUCA environment, which forced organizations to change how they operate (Gössling, Schweiggart, 2022). Adaptable IT helps maintain performance and facilitates government support for business redesign.

In today's organizations, where IT is integral to the workforce, the relationship between employees and technology is paramount (Weisbord, 1976). This is even more crucial in the context of IT adaptability, which undergoes changes, especially in VUCA environment. Adaptable IT influences organizational performance through job performance, but only when employees actively use it (Kabra et al., 2017).

It can be assumed that IT adaptability not only directly influences organizational performance but also shapes the dynamic capabilities of the organization by supporting its employees. This indirect role, as a support for employees who drive the organization's dynamic capabilities, may be more critical for enhancing overall performance than its direct impact.

In conclusion, the literature suggests that IT adaptability positively influences organizational performance. Adaptable IT plays a pivotal role in enabling organizations to navigate challenging times and maintain their performance through the efficiency and effectiveness of their workforce. Therefore, the following hypothesis can be formulated:

H1: IT adaptability is positively influencing organizational performance.

#### **2.4. IT adaptability, organizational performance and VUCA environment**

Agility and utilization of emerging informational technologies are defined as effective strategies for navigating the challenges, posed by the VUCA world. According to Peschl (2023), events of the VUCA environment are the triggers for learning and (radical) transformations that are necessary for organizational success. Therefore, he poses, it is “not sufficient to have only well-established stimulus-response patterns/routines in place”. Cavusgil et al. (2021) discussing the prerequisites of organizational performance of international businesses, suggest that in the VUCA environment, they should adopt an active strategy of advancing their technological capabilities through new partnerships, targeted investments and joint ventures with IT startups and digital entrepreneurs to stay successful in the race for innovations.

In turbulent environments, adaptability is essential for an organization's survival and its ability to maintain performance (Almutairi et al., 2022). The authors' exploratory study, conducted in 2021, confirms that companies recognize the value of IT adaptability in terms of cost saving and organization's competitiveness. Other researchers also argue that a company can obtain a higher level of strategic agility, needed in the VUCA environment, through more flexible IT resources (Pinsonneault, 2011). In turn, their findings indicate that environmental volatility has a positive moderating effect on the relationship between agility and firm performance.

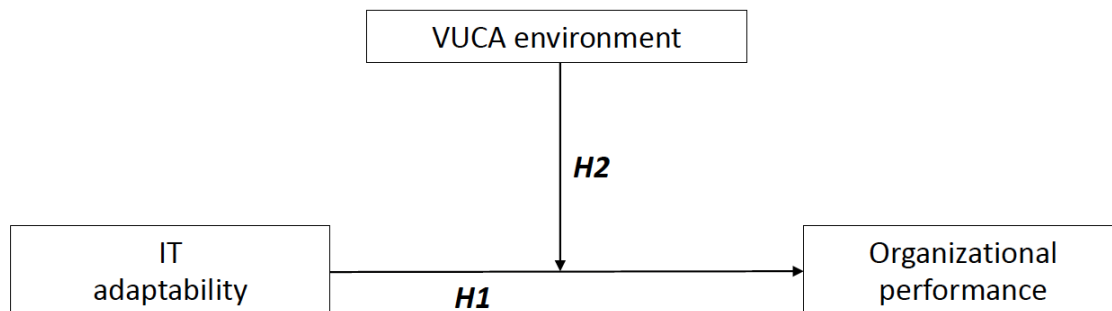
Chen et al., (2014) investigated the influence of agility in business processes, a natural outcome of the VUCA environment, as a moderating factor in the connection between IT capabilities and organizational performance. They demonstrated that an IT-based capability has the potential to yield a favourable effect by fostering adaptable and responsive operations and processes.

Though it seems logical that the VUCA environment might be fostering the role of IT adaptability in organizational performance, Almutairi et al. (2022, p. 744) suppose that it should allow companies to meet industry requirements easily, rapidly and at reasonable cost regardless of the environment dynamics and the duration of the adaptation planning process. Companies should also be aware of the risks of high digital technology diversity, which weakens the role of supply chain learning in operational resilience under VUCA conditions (Liu et al., 2023).

In conclusion, the literature suggests that IT adaptability is of great importance for organizational performance in the current highly dynamic external environment. Adaptable IT plays a pivotal role in enabling organizations to navigate challenging times and maintain their performance through the efficiency and effectiveness of their workforce. Therefore, the following hypothesis can be formulated:

H2: The VUCA environment is strengthening the influence of IT adaptability on organizational performance.

The hypotheses are presented in the Figure 1.



**Figure 1.** Hypotheses development.

Source: own elaboration.

### 3. Research methodology

The proposed theoretical framework was empirically validated through a research project supported by the National Science Center in Poland, under grant No. 2020/37/B/HS4/00130, titled "Development of a Job Performance Model Based on the Dynamic Capabilities of Employees during Various Phases of Organizational Crises." Initially, a pilot study was conducted to assess the efficacy of the research instrument. Subsequently, empirical research was undertaken to test the formulated hypotheses.

The pilot study engaged 25 managers, who served as knowledgeable evaluators. Their valuable feedback was incorporated to enhance the research tool for the primary research phase. Any questions that posed comprehension challenges were rephrased, and measures were taken to mitigate common method bias.

The primary survey was executed during the first quarter of 2021, amid an active wave of the COVID-19 pandemic. It encompassed 1160 organizations operating in Poland, Italy, and the USA. In each organization, a senior-level manager completed a single survey through a procured panel of respondents, and data collection was facilitated using the Computer-Assisted Web Interviewing (CAWI) method. Table 1 presents a breakdown of the sample used in the empirical investigation.



**Table 1.***Sample description*

| Country | Not in crisis | In crisis | Total |
|---------|---------------|-----------|-------|
| Poland  | 83            | 343       | 426   |
| USA     | 95            | 406       | 501   |
| Italy   | 45            | 188       | 233   |
| Total   | 223           | 937       | 1160  |

Source: own elaboration.

**3.1. Variables**

To allow verification of hypotheses the following variables were used: IT adaptability, organizational performance and organizational environment.

IT adaptability: variable assessed on a 5 points' Likert scale (1: I strongly disagree to 5: I strongly agree) using 8 items concerning: support for problems solving, ability to deal with uncertain or unpredictable situations, ease of introducing new tasks, technologies, and procedures, support for various means of communication, ease of infrastructure reconfiguration, handling critical conditions and protocols for emergencies or crisis situations (Tworek, 2023).

Organizational performance: variable assessed on a 5 points' Likert scale (1: I strongly disagree to 5: I strongly agree) using 10 items based on Balances Scorecard concept (Kaplan, Norton, 1996).

Organizational environment: variable assessed on a 5 points' Likert scale (1: I strongly disagree to 5: I strongly agree) using 2 items concerning organizational environment characteristics.

**Table 2.***Variables overview*

| Variable                   | No of items | Alpha Cronbach | AVE (CFA) |
|----------------------------|-------------|----------------|-----------|
| Organizational performance | 10          | 0.886          | 0.494     |
| IT adaptability            | 8           | 0.913          | 0.631     |
| Organizational environment | 2           | 0.843          | 0.568     |

Source: own elaboration.

To determine the suitability of the scales for the study, Cronbach's  $\alpha$  and Factor Analysis were conducted and are presented in Table 2. Given that the scales used were previously validated by their creators, this approach appeared adequate. To avoid any potential common method bias, a systematic method variance control was employed. Based on the results obtained, it can be concluded that nearly all of the measurement scales were well-suited, reliable, and internally consistent.

### 3.2. Moderation analysis

In order to verify the proposed hypotheses, the moderation analysis was performed. The influence of IT adaptability on organizational performance was analyzed in the context of organizational environment to verify the statistical significance of it as moderator of the relation. The hypotheses H1 and H2 will be tested using the linear regression model with moderator, testing the following relation: organizational environment as the moderators of the relation between IT adaptability and organizational performance. The regression models were created using the Process Macro for IBM SPSS. The first model was created as a base for comparison, with only independent variable used as predictor. The second model used both the independent variable and the moderator as predictors. The objective was to examine whether the moderating influence was present in the entire sample, considering that the analyzed relation, using model 1. To confirm it, the third model was introduced using moderator as the only predictor. The statistically significant linear regression model with moderator was obtained, where  $F(3,1159) = 51.953$  and  $p < 0.001$ . The results of the analysis are presented in Table 3.

**Table 3.**  
*Regression models' statistics*

| Model description   | R <sup>2</sup> | Delta R <sup>2</sup> | Moderator coeff. | Standard error | t-stat | p      |
|---|----------------|----------------------|------------------|----------------|--------|--------|
| IT adaptability,<br>Organizational environment,<br>Moderator<br><i>dependent v.: organizational performance</i> | 0.344          | 0.021                | 0.115            | 0.029          | 5.277  | <0.001 |

Source: own elaboration.

The obtained model was the basis for two conclusions. First, the statistically significant regression model was obtained, which allows to confirm the influence of IT adaptability on organizational performance, which is the basis for accepting H1 hypothesis. Second, the obtained results also show that organizational environment is a statistically significant moderator in case of such relation (coeff. = 0.214;  $p < 0.001$ ). Therefore, the result allow to accept the H2 hypothesis, stating that organizational environment boosts the positive influence of IT adaptability on organizational performance.

## 4. Discussion

The purpose of this study was to examine if the characteristics of the environment are strengthening the influence of IT adaptability on organizational performance. Therefore, the research focused on the aspects that enable organizations to survive and operate on the

market. The construct of organizational performance was taken into account, which is crucial from both a practical and theoretical point of view in the field of broadly understood management. In addition, issues regarding the impact of IT on the organization's activities were considered very important, and in particular the focus was on the IT feature of adaptability. All these analysis were set in the contemporary economic context, taking into account the difficulties resulting from the complexity and turbulent nature of the surrounding reality. The results of the research showed that the more VUCA the environment, the stronger the influence of IT adaptability on organizational performance. The built model is statistically significant and well-fitted.

The above reports seem to be consistent with previous discoveries in this area. The impact of information technologies (in many aspects) on performance seems to be undoubted. Bulchand-Gidumal & Melián-González (2011) noticed that investments in IT can contribute to improved organizational performance, but this is not a direct dependence. Therefore, it seemed advisable to look for variables that could influence this relationship. As a consequence the broadly understood influence of the environment, which is currently referred to as VUCA reality, was included in the considerations. This action seems to be consistent with the approach of Trieu et al. (2023), who have proven that in the case of small and medium-sized enterprises, IT capabilities play a crucial role in shaping company performance in times of crisis. Interestingly, these relationships do not only occur among enterprises, but also among organizations serving society. Fan & Pan (2023) noted that information technology has an influence on e-government performance with the moderating role of environmental uncertainty (which is a part of VUCA environment). And such characteristics of the environment seem to indicate a key role in adapting to upcoming opportunities and threats, so the inclusion of IT adaptability turns out to be justified.

## 5. Summary

The results of the conducted research allowed to establish a statistically significant relationship between IT adaptability and organizational performance. Moreover, the role of VUCA environment as a mediator in this relationship was indicated. This means that the specified research gap has been filled and the assumed goal of this article has been achieved.

The findings from this research can contribute to both theoretical and practical implications. From the development of knowledge in the area of management point of view of, there is the contribution to considerations on enhancement the most important aspect for ensuring business continuity - i.e. organizational performance. Moreover, the research took into account IT issues, in particular a very specific one, important in the context of the need to adapt to turbulent conditions of the internal and external environment - IT adaptability. Finally, those deliberation

were enriched by reports on attempts to describe the still not thoroughly understood VUCA reality. It is also worth emphasizing the importance of this research for business practice. The results may become the basis for creating programs for managers who, in order to protect their organizations against the harmful effects of environmental turmoil, will decide to provide IT systems that will have appropriate characteristics ensuring IT adaptability.

Despite the above implications, the research is burdened with certain limitations. First of all, were made in three (although different on many levels) countries - Poland, Italy and the US. Second of all, the organizations subjected to the survey were selected on the basis of purposive manner. Third of all, the research was conducted in specific conditions - during the active wave of the Covid-19 pandemic. Finally, the model includes only three constructs, and organizational performance is multi - dementional, which may simplify the description of reality. Nevertheless, it can be concluded that the analyzes carried out are a solid step towards increasing the state of knowledge in this area, and it is worth basing further research on this. Therefore, it seems that it would be advisable to conduct research in other countries, make measurements in a representative manner, take into account the characteristics of the industries in which companies operate and expand the list of factors influencing organizational performance.

## Acknowledgment

Financed by project no 2020/37/B/HS4/00130 titled “Development of the Job Performance model based on Employees’ Dynamic Capabilities for various phases of a crisis in an organization” funded by the National Science Centre in Poland.

## References

1. Akyuz, G.A., Gursoy, G. (2020). Transformation of Supply Chain Activities in Blockchain Environment. *Contributions to Management Science*, 153-175. [https://doi.org/10.1007/978-3-030-29739-8\\_8](https://doi.org/10.1007/978-3-030-29739-8_8)
2. Albaum, G., Tse, D.K. (2001). Adaptation of international marketing strategy components, competitive advantage, and firm performance: A study of Hong Kong exporters. *Journal of International Marketing*, 9(4), 59-81. <https://doi.org/10.1509/JIMK.9.4.59.19943>
3. Almutairi, A., Ghandour, A. (2021). Enterprise Systems Adaptability and its Role to Determine Organisation Sustainability and Resilience: A Systematic Literature Review. *MENACIS2021*. <https://aisel.aisnet.org/menacis2021/4>

4. Almutairi, A., Naeem, M.A., Weber, G. (2022). Understanding enterprise systems adaptability: An exploratory survey. *Procedia Computer Science*, 197, 743-750. <https://doi.org/10.1016/J.PROCS.2021.12.196>
5. Amin, B., Hakimah, Y., Madjir, S., Noviantoro, D. (2019). The role of transformation leadership in enhancing corporate sustainability capabilities and sustainable supply chain management. *Polish Journal of Management Studies*, 20(2), 83-92. <https://doi.org/10.17512/PJMS.2019.20.2.07>
6. Baard, S.K., Rench, T.A., Kozlowski, S.W.J. (2014). Performance Adaptation: A Theoretical Integration and Review. *Journal of Management*, 40(1), 48-99. <https://doi.org/10.1177/0149206313488210>
7. Bennett, N., Lemoine, J. (2014). What a Difference a Word Makes: Understanding Threats to Performance in a VUCA World. *SSRN Electronic Journal*. <https://doi.org/10.2139/SSRN.2406676>
8. Bernardi, R. (2023). Turning digital in times of crisis: A values-based theory of telehealth adoption during the Covid-19 pandemic. *Information & Management*, 60(6), 103835. <https://doi.org/10.1016/J.IM.2023.103835>
9. Beynon-Davies, P. (2013). *Business information systems*. Palgrave MacMillan.
10. Bieńkowska, A., Koszela, A., Sałamacha, A., Tworek, K. (2022). COVID-19 oriented HRM strategies influence on job and organizational performance through job-related attitudes. *PLoS ONE*, 17(4 April). <https://doi.org/10.1371/JOURNAL.PONE.0266364>
11. Boland, R., Hirschheim, R.A., Rudy, A. (1987). *Critical issues in information systems research*, 394.
12. Bulchand-Gidumal, J., Melián-González, S. (2011). Maximizing the positive influence of IT for improving organizational performance. *The Journal of Strategic Information Systems*, 20(4), 461-478. <https://doi.org/10.1016/J.JSIS.2011.09.004>
13. Caporuscio, A., Schiavone, F., Bernhard, F., Escobar, O. (2023). The role of B2B digital platforms for managing future worldwide crisis. A strategic sensitivity framework for exploiting the breakthrough technological innovations. *Technological Forecasting and Social Change*, 194, 122741. <https://doi.org/10.1016/J.TECHFORE.2023.122741>
14. Cavusgil, S.T., van der Vegt, S., Dakhli, M., De Farias, S., Doria, E., Eroglu, S., Wang, E.Y. (2021). *International Business in an Accelerated VUCA World: Trends, Disruptions, and Coping Strategies*. <https://papers.ssrn.com/abstract=4167237>
15. Chen, Y., Wang, Y., Nevo, S., Jin, J., Wang, L., Chow, W.S. (2014). IT capability and organizational performance: The roles of business process agility and environmental factors. *European Journal of Information Systems*, 23(3), 326-342. <https://doi.org/10.1057/EJIS.2013.4/TABLES/5>
16. Ciolacu, M.I., Mihailescu, B., Rachbauer, T., Hansen, C., Amza, C.G., Svasta, P. (2023). Fostering Engineering Education 4.0 Paradigm Facing the Pandemic and VUCA World. *Procedia Computer Science*, 217, 177-186. <https://doi.org/10.1016/J.PROCS.2022.12.213>

17. Darvishmotevali, M., Ali, F. (2020). Job insecurity, subjective well-being and job performance: The moderating role of psychological capital. *International Journal of Hospitality Management*, 87. <https://doi.org/10.1016/J.IJHM.2020.102462>
18. DeLone, W.H., McLean, E.R. (2003). The DeLone and McLean model of information systems success: A ten-year update. *Journal of Management Information Systems*, 19(4), 9-30. <https://doi.org/10.1080/07421222.2003.11045748>
19. Du, J., Chen, Z. (2018). Applying Organizational Ambidexterity in strategic management under a “VUCA” environment: Evidence from high tech companies in China. *International Journal of Innovation Studies*, 2(1), 42-52. <https://doi.org/10.1016/J.IJIS.2018.03.003>
20. Fan, B., Pan, T. (2023). Does information technology–organizational resource interaction affect E-government performance? Moderating roles of environmental uncertainty. *Government Information Quarterly*, 40(3), 101830. <https://doi.org/10.1016/J.GIQ.2023.101830>
21. Garud, R., Dunbar, R.L.M., Bartel, C.A. (2011). Dealing with Unusual Experiences. *Organization Science*, 22(3), 587-601. <https://doi.org/10.1287/ORSC.1100.0536>
22. Gaule, E., Jovarauskiene, D., Petrauskiene, R., Pravalinskas, M., Rauleckas, R. (2023). Managerial approaches, frameworks, and practices for business model application in public services management in the VUCA environment. *Engineering Management in Production and Services*, 15(3), 84-100. <https://doi.org/10.2478/EMJ-2023-0022>
23. Germundssona, L.B., Frankelius, P., Norrman, C. (2021). The Role Of Innovation Intermediary Organisations In Forming Value Creating Meetings: The Agri-Food Firm Perspective. *International Food and Agribusiness Management Review*, 24(6), 992-1004. <https://doi.org/10.22434/IFAMR2020.0167>
24. Giones, F., Brem, A., Berger, A. (2019). Strategic decisions in turbulent times: Lessons from the energy industry. *Business Horizons*, 62(2), 215-225. <https://doi.org/10.1016/J.BUSHOR.2018.11.003>
25. Gläser, W. (2023). VUCA as a practical model: A commentary. *Journal of Applied Journalism and Media Studies*, 12(2), 267-275. [https://doi.org/10.1386/AJMS\\_00117\\_1/CITE/REFWORKS](https://doi.org/10.1386/AJMS_00117_1/CITE/REFWORKS)
26. Gössling, S., Schweiggart, N. (2022). Two years of COVID-19 and tourism: what we learned, and what we should have learned. *Journal of Sustainable Tourism*, 30(4), 915-931. <https://doi.org/10.1080/09669582.2022.2029872>
27. Groenewald, D., Okanga, B. (2019). Optimising enterprise resource planning system to leverage a firm’s absorptive and adaptive capabilities. *South African Journal of Information Management*, 21(1), 1-15. <https://doi.org/10.4102/SAJIM.V21I1.962>
28. Gronau, N., Rohloff, M. (2007). Managing Change: Business / IT Alignment and Adaptability of Information Systems. *European Conference on Information Systems*.

29. Hall, R.D., Rowland, C.A. (2016). Leadership development for managers in turbulent times. *Journal of Management Development*, 35(8), 942-955. <https://doi.org/10.1108/JMD-09-2015-0121/FULL/XML>
30. Heart, T., Maoz, H., Pliskin, N. (2010). From governance to adaptability: The mediating effect of IT executives' managerial capabilities. *Information Systems Management*, 27(1), 42-60. <https://doi.org/10.1080/10580530903455163>
31. Jacks, T., Palvia, P., Schilhavy, R., Wang, L. (2011). A framework for the impact of IT on organizational performance. *Business Process Management Journal*, 17(5), 846-870. <https://doi.org/10.1108/14637151111166213>
32. Kabra, G., Ramesh, A., Akhtar, P., Dash, M.K. (2017). Understanding behavioural intention to use information technology: Insights from humanitarian practitioners. *Telematics and Informatics*, 34(7), 1250-1261. <https://doi.org/10.1016/J.TELE.2017.05.010>
33. Khalil, A., Abdelli, M.E.A., Mogaji, E. (2022). Do Digital Technologies Influence the Relationship between the COVID-19 Crisis and SMEs' Resilience in Developing Countries? *Journal of Open Innovation: Technology, Market, and Complexity*, 8(2), 100. <https://doi.org/10.3390/JOITMC8020100>
34. Khurana, I., Dutta, D.K., Singh Ghura, A. (2022). SMEs and digital transformation during a crisis: The emergence of resilience as a second-order dynamic capability in an entrepreneurial ecosystem. *Journal of Business Research*, 150, 623-641. <https://doi.org/10.1016/J.JBUSRES.2022.06.048>
35. Koronis, E., Ponis, S. (2018). Better than before: the resilient organization in crisis mode. *Journal of Business Strategy*, 39(1), 32-42. <https://doi.org/10.1108/JBS-10-2016-0124/FULL/XML>
36. Lechler, S., Canzaniello, A., Roßmann, B., von der Gracht, H.A., Hartmann, E. (2019). Real-time data processing in supply chain management: revealing the uncertainty dilemma. *International Journal of Physical Distribution and Logistics Management*, 49(10), 1003-1019. <https://doi.org/10.1108/IJPDLM-12-2017-0398/FULL/XML>
37. Liu, X., Tse, Y.K., Wang, S., Sun, R. (2023). Unleashing the power of supply chain learning: an empirical investigation. *International Journal of Operations and Production Management*, 43(8), 1250-1276. <https://doi.org/10.1108/IJOPM-09-2022-0555>
38. Liu, Y., Esangbedo, M.O., Bai, S. (2019). Adaptability of Inter-Organizational Information Systems Based on Organizational Identity: Some Factors of Partnership for the Goals. *Sustainability*, Vol. 11(5), 1436. <https://doi.org/10.3390/SU11051436>
39. Mahajan, A., Baride, M. (2023). Fast Track Implementation of Large Projects in Today's VUCA Environment. *Day 3 Wed, October 04, 2023*. <https://doi.org/10.2118/216728-MS>
40. Marques-Quinteiro, P., Vargas, R., Eifler, N., Cural, L. (2018). Employee adaptive performance and job satisfaction during organizational crisis: The role of self-leadership. *European Journal of Work and Organizational Psychology*, 28(1), 1-16. <https://doi.org/10.1080/1359432X.2018.1551882>

41. Ngo-Ye, L., Ahsan, M. (2005). Enterprise IT Application Systems Agility and Organizational Agility. *AMCIS 2005 Proceedings*. <https://aisel.aisnet.org/amcis2005/159>
42. Patrucco, A.S., Kähkönen, A.K. (2021). Agility, adaptability, and alignment: new capabilities for PSM in a post-pandemic world. *Journal of Purchasing and Supply Management*, 27(4), 100719. <https://doi.org/10.1016/J.PURSUP.2021.100719>
43. Peschl, M.F. (2023). Learning from the future as a novel paradigm for integrating organizational learning and innovation. *Learning Organization*, 30(1), 6-22. <https://doi.org/10.1108/TLO-01-2021-0018>
44. Pinsonneault, P.P.T. (2011). Competing Perspectives on the Link Between Strategic Information Technology Alignment and Organizational Agility: Insights from a Mediation Model. *MIS Quarterly*, 35(2), 463-486. <https://misq.umn.edu/competing-perspectives-on-the-link-between-strategic-information-technology-alignment-and-organizational-agility-insights-from-a-mediation-model.html>
45. Raghuram, P., Bhupesh, S., Manivannan, R., Anand, P.S.P., Sreedharan, V.R. (2023). Modeling and Analyzing the Inventory Level for Demand Uncertainty in the VUCA World: Evidence From Biomedical Manufacturer. *IEEE Transactions on Engineering Management*, 70(8), 2944-2954. <https://doi.org/10.1109/TEM.2022.3201440>
46. Rimita, K., Hoon, S., Levasseur, R. (2020). Leader Readiness in a Volatile, Uncertain, Complex, and Ambiguous Business Environment. *Journal of Social Change*, 12. <https://doi.org/10.5590/JOSC.2020.12.1.02>
47. Shams, R., Vrontis, D., Belyaeva, Z., Ferraris, A., Czinkota, M.R. (2021). Strategic agility in international business: A conceptual framework for “agile” multinationals. *Journal of International Management*, 27(1), 100737. <https://doi.org/10.1016/J.INTMAN.2020.100737>
48. Stank, T., Lackey, C. (1997). Enhancing Performance through Logistical Capabilities in Mexican Maquiladora Firms. *Journal of Business Logistics*, 18(1), 91-123. <https://www.scirp.org/%28S%28czech2tfqyw2orz553k1w0r45%29%29/reference/referencepapers.aspx?referenceid=423434>
49. Strotmann, C., Baur, V., Börnert, N., Gerwin, P. (2022). Generation and prevention of food waste in the German food service sector in the COVID-19 pandemic – Digital approaches to encounter the pandemic related crisis. *Socio-Economic Planning Sciences*, 82, 101104. <https://doi.org/10.1016/J.SEPS.2021.101104>
50. Trieu, H.D.X., Nguyen, P. Van, Nguyen, T.T.M., Vu, H.T.M., Tran, K.T. (2023). Information technology capabilities and organizational ambidexterity facilitating organizational resilience and firm performance of SMEs. *Asia Pacific Management Review*. <https://doi.org/10.1016/J.APMRV.2023.03.004>
51. Troise, C., Corvello, V., Ghobadian, A., O’Regan, N. (2022). How can SMEs successfully navigate VUCA environment: The role of agility in the digital transformation era.



- Technological Forecasting and Social Change*, 174. <https://doi.org/10.1016/j.techfore.2021.121227>
52. Tworek, K. (2023). Information Technology in Contemporary Organizations: Redefining IT Management for Organizational Reliability. *Information Technology in Contemporary Organizations: Redefining IT Management for Organizational Reliability*, 1-130. <https://doi.org/10.4324/9781003365044/INFORMATION-TECHNOLOGY-CONTEMPORARY-ORGANIZATIONS-KATARZYNA-TWOREK>
53. U.S. Army Heritage & Education Center (2022). *Who first originated the term VUCA (Volatility, Uncertainty, Complexity and Ambiguity)? - USAHEC Find Your Answer.* <https://usawc.libanswers.com/faq/84869>
54. van der Wal, Z. (2017). The 21st Century Public Manager. *The 21st Century Public Manager*, 248-259. [https://doi.org/10.1057/978-1-137-50744-0\\_12](https://doi.org/10.1057/978-1-137-50744-0_12)
55. Vogus, T.J., Sutcliffe, K.M. (2007). *Organizational resilience: Towards a theory and research agenda.* Conference Proceedings - IEEE International Conference on Systems, Man and Cybernetics, 3418-3422. <https://doi.org/10.1109/ICSMC.2007.4414160>
56. Wanasida, S.A., Bernarto, I., Sudibjo, N., Purwanto, A. (2021). The Role of Business Capabilities in Supporting Organization Agility and Performance During the COVID-19 Pandemic: An Empirical Study in Indonesia. *The Journal of Asian Finance, Economics and Business*, 8(5), 897-911. <https://doi.org/10.13106/JAFEB.2021.VOL8.NO5.0897>
57. Weisbord, M.R. (1976). *Organizational Diagnosis: Six Places To Look for Trouble with or Without a Theory*, <https://doi.org/10.1177/105960117600100405>, 1(4), 430-447. <https://doi.org/10.1177/105960117600100405>
58. Zabłocka-Kluczka, A., Sałamacha, A.K. (2023). Organizational resilience as the mediator of relation between brand performance and organizational performance – reflections from the perspective of crisis times. *Journal of Organizational Change Management.* <https://doi.org/10.1108/JOCM-04-2023-0122/FULL/HTML>
59. Zeng, M., Lu, J. (2021). The impact of information technology capabilities on agri-food supply chain performance: the mediating effects of interorganizational relationships. *Journal of Enterprise Information Management*, 34(6), 1699-1721. <https://doi.org/10.1108/JEIM-08-2019-0237>
60. Zhang-Zhang, Y.Y., Rohlfer, S., Varma, A. (2022). Strategic people management in contemporary highly dynamic VUCA contexts: A knowledge worker perspective. *Journal of Business Research*, 144, 587-598. <https://doi.org/10.1016/J.JBUSRES.2021.12.069>
61. Zia, N.U., Shamim, S., Zeng, J., Awan, U., Chromjakova, F., Akhtar, P., Orel, M. (2023). Avoiding crisis-driven business failure through digital dynamic capabilities. B2B distribution firms during the COVID-19 and beyond. *Industrial Marketing Management*, 113, 14-29. <https://doi.org/10.1016/J.INDMARMAN.2023.05.015>