

# PRO-INNOVATION ACTIVITIES IN SHAPING THE ORGANIZATIONAL RESILIENCE

## DZIAŁANIA PROINNOWACYJNE W KSZTAŁTOWANIU ODPORNOŚCI ORGANIZACYJNEJ

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**Jacek Woźniak**

Poland, Military University of Technology in Warsaw  
Faculty of Security, Logistics and Management, Institute of Organization and Management  
jacek.wozniak@wat.edu.pl, ORCID: 0000-0001-7592-0109

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**Abstract:** This work aims to identify factors/activities that may affect the complexity of ensuring organizational resilience, as well as the complexity of the importance of ensuring organizational resilience shaped in innovative organizations; and to assess these phenomena in Polish innovative entities. Theoretical methods have been used in the study, i.e., analysis, synthesis, and query of the scientific literature. Inductive inference, as well as elements of deductive inference, have been used. The empirical CAWI survey technique and statistical analysis of quantitative data have also been used. The study used factor analysis, cluster analysis, the analysis of descriptive statistics, and the Kruskal–Wallis test for independent samples. Studies have shown that the complexity of ensuring organizational resilience (ICAOR indicator) and the complexity of the importance of ensuring organizational resilience (ICIOR indicator) is moderate. Moreover, there is a relatively small “gap” between respondents’ assessment of the level of implementation of factors and activities and the importance of the same factors/activities in the context of ensuring organizational resilience.

**Keywords:** management, organization, innovations, resilience

**Abstrakt:** Celem pracy jest identyfikacja czynników/działań, które mogą wpływać na złożoność zapewnienia odporności organizacyjnej, a także złożoność znaczenia zapewnienia odporności organizacyjnej kształtowanej w innowacyjnych organizacjach, a także ocena tych zjawisk w polskich podmiotach innowacyjnych. W badaniu zostały zastosowane metody teoretyczne, tj. analiza, synteza oraz kwerenda literatury przedmiotu. Wykorzystano wnioskowanie indukcyjne, jak i elementy wnioskowania dedukcyjnego. Zastosowano również empiryczną technikę badania ankietowego CAWI oraz technikę statystycznej analizy danych ilościowych. Wykorzystano analizę czynnikową, analizę skupień, analizę statystyk opisowych, a także test Kruskala–Wallisa dla prób niezależnych. Badania wykazały, że złożoność zapewnienia odporności organizacyjnej (wskaźnik ICAOR), a także złożoność znaczenia zapewnienia odporności organizacyjnej (wskaźnik ICIOR) są na umiarkowanym poziomie. Co więcej, istnieje stosunkowo mała „luka” pomiędzy oceną respondentów dla poziomu realizacji czynników/działań, a znaczeniem tych samych czynników/działań w kontekście zapewnienia odporności organizacyjnej.

**Słowa kluczowe:** zarządzanie, organizacja, innowacje, odporność

## Introduction

Modern organizations are looking for various solutions to ensure stable and sustainable development. Each entity understands such action differently, which results from its needs, capabilities, and limitations (e.g., resources). Often, planning the development of an organization is “embedded” in the context of the so-called security management and creating organizational resilience<sup>1</sup>. This

is a correct and appropriate approach because it comes to analyzing the opportunity and threat factors. The skillful identification of such elements can ensure a proper level of resilience of the organization to specific events (e.g., unfavorable) and increase its chances of using beneficial factors. Therefore, the awareness of factors that may affect the security and, thus, the organization’s resilience is essential. In the case of innovative

<sup>1</sup> In the article, the terms of *organizational resilience* and *resilience of the organization* are used interchangeably.

entities, this is particularly important because they are the units firmly focused on creating value for the environment and cooperating with other entities, e.g., in the sharing economy circumstances, as well as digitization and virtualization of business and social processes. In addition, ensuring organizational resilience in this class of entities can be complex and multifaceted.

Accordingly, this article aims to identify factors/activities that may affect the complexity of ensuring organizational resilience, as well as the complexity of the importance of ensuring organizational resilience shaped in innovative organizations, and to assess these phenomena in Polish innovative entities.

The article consists of four main parts: literature review, research methodology, results, and discussion, as well as conclusions.

### **Literature review**

Organizational resilience can be defined in different ways. Therefore, there are other ways of creating it. Everything depends, e.g., on what type of organization is considered, as well as what its so-called “initial potential” for systematic development in a given environment and what actions can be taken as part of preventive, corrective, and improvement initiatives. In innovative entities, the basis for assurance resilience can be seen primarily in the activities supporting the broadly understood innovative approach, the implementation of innovative processes, and the effects of these processes, i.e., innovations. It is also essential for innovative organizations that resilience should be seen as the basis for shaping development and can be linked to the measurement of activities in a given entity at different levels of management (see Stephenson, 2010; Akgün, Keskin, 2014). This is because various groups of employees and levels of management should be involved in innovation processes. What is more, nowadays, the functioning of innovative entities in the so-called sharing economy model is becoming very important, which additionally directs organizational resilience to cooperation, improving relations with stakeholders, sharing valuable resources, and using the potential of ICT technologies (see Zgiep, 2014, p. 203; European Commission, 2016, p. 3).

At this point, however, it is worth first pointing out how the organization’s resilience should be defined. A. Zabłocka-Kluczka (2012, p. 95) argues that the resilience of an organization is a particular property “enabling its survival and sustainable development, which is built on the one hand by the invulnerability, insensitivity of the organization to the impact of crisis factors, enabling the avoidance of problems and difficulties, on the other hand, the ability to resist the impact of crisis factors (i.e., the ability of the organization to react to their occurrence, regardless of their location (external, internal)), i.e., in essence, the ability of the organization to maintain its integrity (survival) and correct (satisfactory) operation during the impact of crisis factors on it or the state of the organization conditioned by the totality of management processes aimed at restoring the integrity of its internal environment (i.e., ensuring sustainability and sustainable development), violated by crisis factors.” This definition seems comprehensive and multifaceted, representing the essence of organizational resilience.

It is worth noting, however, that different authors emphasize different attributes of organizational resilience, which may additionally affect how it is provided. Table 1 presents examples of organizational resilience attributes and their relationship to risk and security management in the organization. It should be remembered that risk and security are a kind of “foundation” for shaping organizational resilience (Commonwealth of Australia, 2011; ISO, 2017; Soliwoda, 2020, p. 39).

Returning to the peculiarity of innovative organizations – as previously mentioned – the resilience of organizations can be influenced by broadly understood innovation processes and innovations themselves. Table 2 identifies the potential impact of four basic types of invention on shaping organizational resilience. It is worth emphasizing here that each type of innovation, supported by various factors/actions, can be considered in different dimensions. For example, product innovations may have “assigned” the financial, market, relational, and technological dimensions. However, the choice of the dimension of interpretation and analysis of the organization’s resilience should be determined by what “model” of perception of this resilience has been adopted in a given entity and what “system” of ensuring it has been formally (or informally) established.

**Table 1.** Essential attributes of organizational resilience

Authors	Attributes	Connections with risk and security management
Sun et al. (2011)	<ul style="list-style-type: none"> <li>• Process of change,</li> <li>• set of adaptability,</li> <li>• entrepreneurship focus,</li> <li>• growing after a crisis, disruption, or challenge.</li> </ul>	<ul style="list-style-type: none"> <li>• Focus on prevention and restoration activities,</li> <li>• identification of both opportunity and threat factors,</li> <li>• incorporating opportunity and threat factors into the organization's development process – in other words, the use of opportunity and threat factors in the process of systematically shaping the security of the organization,</li> </ul>
Carmeli, Markman (2011)	<ul style="list-style-type: none"> <li>• Continuous process implemented as part of strategic management,</li> <li>• the ability to balance expansion strategies with risk factors.</li> </ul>	<ul style="list-style-type: none"> <li>• paying attention to both resource and process approaches to ensure the security of the organization,</li> <li>• using a holistic approach,</li> </ul>
Välikangas, Romme (2012)	<ul style="list-style-type: none"> <li>• The sum of the so-called partial resiliences in the organization,</li> <li>• strategic and operational dimension.</li> </ul>	<ul style="list-style-type: none"> <li>• including in ensuring the safety of the organization various phases of its development, e.g., lessons learned from the past, as so-called “good practices”,</li> </ul>
Kahn et al. (2018)	<ul style="list-style-type: none"> <li>• Ability to absorb loads and maintain or improve performance.</li> </ul>	<ul style="list-style-type: none"> <li>• taking into account the behaviors/efforts of different employee groups (e.g., managers and line employees) in risk management and paying attention to the importance of the quality of different classes of resources used in processes, e.g., innovative ones.</li> </ul>
Hillmann, Guenther (2021)	<ul style="list-style-type: none"> <li>• Ability to operate in harsh environments,</li> <li>• result of the organization's activities,</li> <li>• the process or behavior of the organization and its employees.</li> </ul>	

Source: own study based on Hillmann, Guenther, 2021, pp. 8–9; Kahn et al., 2018, p. 509.

**Table 2.** Innovations and their potential impact on organizational resilience

Type of innovation	Potential impact on organizational resilience	Dimensions of organizational resilience
Product	<ul style="list-style-type: none"> <li>• Providing new products and services to the environment that may create a higher value than the market offer of competitors,</li> <li>• focus on value for stakeholders and increase their “attachment” to the organization,</li> <li>• improvement of design activities,</li> <li>• using the experience of other organizations and drawing on the knowledge available in the environment – e.g., low cost of acquiring know-how.</li> </ul>	<ul style="list-style-type: none"> <li>• Financial,</li> <li>• market,</li> <li>• relational,</li> <li>• technological</li> </ul>
Process	<ul style="list-style-type: none"> <li>• Improvement of information and decision-making processes through the implementation or development of ICTs (digital media),</li> <li>• entering the organization into virtual/network forms of cooperation – the possibility of using the potential and resources of other geographically distant entities, as well as the synergy effect (e.g., in the open innovation model),</li> <li>• optimization of product and service distribution processes – reducing costs and shortening the time of process implementation,</li> <li>• providing the organization (particularly the organization's innovation system) with adequate resources, such as employees, can result in business continuity.</li> </ul>	<ul style="list-style-type: none"> <li>• Employee,</li> <li>• logistical,</li> <li>• financial,</li> <li>• material,</li> <li>• technological,</li> <li>• relational</li> </ul>
Organizational	<ul style="list-style-type: none"> <li>• Supporting learning, knowledge creation, and knowledge-sharing processes within the organization and with external stakeholders,</li> <li>• development of an organizational culture conducive to innovation, creativity, and cooperation,</li> <li>• systematic improvement of management processes and raising the accuracy of decisions.</li> </ul>	<ul style="list-style-type: none"> <li>• Technological,</li> <li>• social,</li> <li>• relational</li> </ul>
Marketing	<ul style="list-style-type: none"> <li>• Searching for and implementing new (often even unobvious) forms and tools for promoting innovation in the environment – increasing the level of interest of recipients, creating value, expanding the so-called “reach” of the organization,</li> <li>• development of the “instruments” of promotional activities, which may result in a relative “weakening” of competitors,</li> <li>• development of after-sales services – increasing customer confidence in the organization and consolidating relationships with customers by providing, for example, warranty and post-warranty services.</li> </ul>	<ul style="list-style-type: none"> <li>• Market,</li> <li>• social,</li> <li>• logistical,</li> <li>• financial</li> </ul>

Source: own study based on OECD/Eurostat, 2018, pp. 70-78.

Summing up the above content, it should be noted that specific factors/activities supporting innovative processes (in various dimensions) can improve the “mechanisms” of shaping organizational resilience. The complexity of this phenomenon will be presented and assessed later in this article.

### Research Methodology

The subject of the study is the shaping of the resilience of organizations conducting innovative activities in Poland. The study takes into account the aspect of external conditions related to the ever-increasing development processes of the so-called digital economy (see Schwab, 2018; Wang et al., 2020) and the sharing economy (see de Oliveira Netto, Tello-Gamarra, 2020, p. 41 et seq.; Bai, Velamuri, 2021, p. 979 et seq.; Fritze et al., 2021, p. 4 et seq.). In other words, the study aims to present the peculiarity of organizations’ broadly understood resilience in the context of changes taking place in the environment. In addition, the study assumes that the organization’s security is the basis for shaping its resilience.

The work aims to identify factors/activities that may affect the complexity of ensuring organizational resilience, as well as the complexity of the importance of ensuring organizational resilience shaped in innovative organizations, and to assess these phenomena in Polish innovative organizations.

The research problem reads: How is the peculiarity and complexity of ensuring organizational resilience in innovative organizations? The research questions are as follows:

- RQ1. What is the level of respondents’ assessment of the complexity of ensuring organizational resilience and the complexity of the importance of ensuring organizational resilience?
- RQ2. Is there a “gap” between respondents’ assessment of the level of implementation of given factors/activities (in the area of creating innovations, increasing the level of innovativeness of the organization, and improving innovative processes) and the importance of the same factors/activities – in the context of ensuring organizational resilience?
- RQ3. Do the essential attributes of organizations (age, average annual turnovers, scale of the organization’s operations, and leading business profile) differentiate how respondents assess the complexity of ensuring organizational resilience and the complexity of the importance of ensuring organizational resilience?

The survey was conducted in July–August 2021 on a sample of 100 organizations (micro, small, and medium-sized entities based in Poland, as well as conducting their activities mainly in Poland) belonging to the so-called high-tech sectors, and more specifically to the sub-sector of high-tech knowledge-intensive services (see Inkubatory, 2021; PKD, 2022):

1. Activities related to producing films, video recordings, television programs, and sound and music recordings (department no. 59, according to PKD).
2. Broadcasting of public and subscription programs (department no. 60).
3. Telecommunications (department no. 61).
4. Software and IT consulting and related activities (department no. 62).
5. Information service activities (department no. 63).
6. Research and development (department no. 72).

The survey covered the entire country but finally included respondents from thirteen voivodships (except for the Opolskie, Podkarpackie, and Świętokrzyskie voivodeships). The study used a random (proportional stratified) selection of organizations for the research sample. Respondents were owners of organizations or managers responsible for risk management, innovation processes, or project management.

Theoretical methods have been used in the study, i.e., analysis, synthesis, and query of the scientific literature. In addition, inductive inference has been used – at the stage of empirical data analysis, as well as elements of deductive inference, mainly during literature queries (based on Hajduk, 2012, p. 119; Sułkowski, 2012, p. 95 et seq.; Stochaj, Roman, 2013, pp. 194–192; Wojciechowska, 2016, p. 116 et seq.). The empirical CAWI (Computer-Assisted Web Interviewing) survey technique has also been used and the technique of statistical analysis of quantitative data (based on Apanowicz, 2005, p. 57 et seq.). The study (on the issues of shaping the resilience of organizations) has used the following research tools: (1) CAWI questionnaire, which included metrics – 5 questions, as well as the central part – 5 questions (including one screening question – whether at least five innovations have been fully and correctly implemented in the last five years of the organization’s activity, and whether the organization simultaneously shares resources with other

participants in innovation processes\* ), as well as (2) PS IMAGO PRO 8.0, and MS Excel software. The study also used factor analysis (PCA method), cluster analysis (*k*-mean method), the analysis of descriptive statistics, and the Kruskal–Wallis test for independent samples.

The research sample was slightly dominated by “mature” organizations, i.e., those operating on the market for over 11 years (37%). A slightly smaller percentage were “young” entities, i.e., operating on the market for 1-5 years (32%), and “relatively young”, i.e., operating on the market for 6-10 years (31%). In addition, the same number of organizations (20 entities) belonging to the following PKD departments (59 and 60, 61, 62, 63, and 72) qualified for the research sample. Other attributes of the surveyed organizations and the list of

voivodeships in which they have their headquarters are included in Table 3.

Answering the above research questions requires the development of an essential list of factors/activities in the area of creating innovations, increasing the level of innovativeness of the organization, and improving innovative processes that can potentially condition/shape the organization’s resilience level. Table 4 lists 22 factors/actions based on: Romanowska (2012), Dworzecki and Leśniak-Łebkowska (2018), OECD/Eurostat (2018), Koziol-Nadolna (2019), Accenture (2019), de Moura et al. (2021), Kaçmaz and Çevirgen (2021), as well as Țiclău et al. (2021). According to the *Oslo Manual* publication, these factors/activities have also been assigned to four types of innovation (OECD/Eurostat, 2018, p. 75) (Table 5).

**Table 3.** Essential attributes of the surveyed organizations (N=100)

	N	%		N	%
<b>The scale of operation:</b>					
Local (one city/municipality/district)	36	36	European (at least one country in Europe outside Poland)	14	14
Regional (1– 8 voivodships in Poland)	24	24	International (at least one country in the world outside Europe – including Poland)	7	7
National (9–16 voivodships in Poland)	19	19			
<b>Average annual turnovers (PLN million):</b>					
0–0,5	34	34	2–2,5	3	3
0,5–1	24	24	2,5–3	4	4
1–1,5	16	16	More than 3	12	12
1,5–2	7	7			
<b>Voivodeship:</b>					
Dolnośląskie	10	10	Podlaskie	6	6
Kujawsko–Pomorskie	6	6	Pomorskie	12	12
Lubelskie	3	3	Śląskie	18	18
Lubuskie	2	2	Warmińsko–Mazurskie	2	2
Łódzkie	2	2	Wielkopolskie	10	10
Małopolskie	7	7	Zachodniopomorskie	5	5
Mazowieckie	17	17			
TOTAL:		100	100	TOTAL: 100 100	

Source: own study.

**Table 4.** Activities in the area of creating innovations, increasing the level of innovativeness of the organization and improving innovative processes – factors used to construct indicators

No.	Factors
f1	Investments in ICTs used in innovation processes.
f2	Bringing better solutions/services to the market than competitors.
f3	Searching for and acquiring new customers.
f4	Engaging new project partners and/or engaging a key client.
f5	Adding new functions to products/services.

\* Respondents answered “yes”/”no”. When a respondent answered “no”, she/he was not included in the study.

- f6 Focus on a must-have for the user/customer.
- f7 Applying new forms of the promotion of innovations.
- f8 Ensuring sufficient funding for innovation/project/development activities.
- f9 Ensuring the financial liquidity of the company.
- f10 Reduction of costs of implementing innovations/new solutions/products/services.
- f11 Counteracting the activity of new competitors or weakening their activities.
- f12 Reduction of costs of recruiting employees.
- f13 Stability of the workforce (durability of employment).
- f14 Ensuring qualifications and critical competencies of employees responsible for the innovation processes.
- f15 Development of an organizational culture that supports creativity.
- f16 Improvement of communication processes in the organization and knowledge management.
- f17 Establishing relationships with external entities/stakeholders.
- f18 Improvement of planning processes in the organization.
- f19 Improvement of control processes in the organization.
- f20 Improvement of employee motivation processes.
- f21 Improvement of quality management of innovative processes.
- f22 Application of risk management.

Source: own study.

**Table 5.** Activities in the area of creating innovations, increasing the level of innovativeness of the organization and improving innovative processes – the perspective of four types of innovations

Type of innovation	Basic activities (see Table 4)
Product	f2; f5; f6
Process	f1; f4; f10; f14; f21
Organizational	f8; f9; f12; f13; f15; f16; f17; f18; f19; f20; f22
Marketing	f3; f7; f11

Source: own study.

The activities/factors listed in Table 4 have been used to develop two composite indicators: (1) ICAOR and (2) ICIOR, which were used to answer the research questions. The interpretation of these indicators is as follows:

1. The indicator of the complexity of ensuring organizational resilience (ICAOR) – indicates how many factors/activities (in the area of creating innovations, increasing the level of innovativeness of the organization, and improving innovative processes), and to what extent are implemented by respondents to assure organizational resilience.
2. The indicator of the complexity of the importance of ensuring organizational resilience (ICIOR) – indicates how many factors/activities (in the area of creating innovations, increasing the level of innovativeness of the organization, and improving innovative processes), and to what extent are important to respondents to assure organizational resilience.

In other words, all 22 factors/activities related to organizational resilience issues (Table 4) have

been assessed twice by respondents. First, respondents assessed the level of implementation of a given factor/activity in their organizations and then the importance of a given factor/action in ensuring/shaping resilience. The assessment was made on a 5-point scale, where the value “1” meant “no implementation or no importance of the factor/activity”, and the value “5” meant “widespread implementation or very high importance of the factor/activity”.

When considering the first indicator (ICAOR), it should be noted that it consists of eight components (Table 7) to which the weights are assigned. The Alpha Cronbach coefficient for 22 factors/actions is 0,855 (Table 6). The components have been constructed using the methodological recommendations developed by the OECD (2008) and the following studies (Nardo et al., 2005; Williams et al., 2010; Hudrliková, 2013). The components have been obtained using the factor analysis method (method of extracting factors – the Principal Component Analysis; the rotation method – Varimax with Kaiser normalization) (Table 7).

**Table 6.** The Alpha Cronbach, KMO, and Bartlett tests – ICAOR (N=100)

Alpha Cronbach	Value	0,855
	Number of positions	22
Kaiser-Mayer-Olkin (KMO) measure of sample adequacy		0,730
Bartlett sphericity test	Approximated chi-square	643,732
	df	231
	p	<0,001

Source: own study.

**Table 7.** The total explained variance – ICAOR (N=100)

Component	Initial eigenvalues			Sums of load squares after rotation			Weight
	Total	% variance	% cumulated	Total	% variance	% cumulated	
C1	5,626	25,574	25,574	2,343	10,651	10,651	0,16
C2	1,652	7,509	33,083	2,027	9,213	19,864	0,14
C3	1,572	7,146	40,228	1,996	9,074	28,938	0,13
C4	1,332	6,056	46,284	1,971	8,959	37,897	0,13
C5	1,279	5,816	52,100	1,907	8,670	46,567	0,13
C6	1,205	5,478	57,578	1,675	7,615	54,182	0,11
C7	1,116	5,072	62,650	1,574	7,155	61,337	0,11
C8	1,004	4,565	67,215	1,293	5,877	67,215	0,09

Rotation converged in 39 iterations. Source: own study.

Finally, the indicator of the complexity of ensuring organizational resilience (ICAOR) has adopted the weighted average formula of all 22 factors:

$$\begin{aligned} \text{ICAOR} = & [0,16 \cdot (f_{19} + f_{20} + f_{21} + f_{22})/4] + [0,14 \cdot \\ & (f_{12} + f_{14} + f_{15} + f_{17})/4] + [0,13 \cdot (f_5 + f_{10})/2] + [0,13 \cdot (f_3 + f_6 \\ & + f_7)/3] + [0,13 \cdot (f_{11} + f_{16} + f_{18})/3] + [0,11 \cdot (f_2 + f_8)/2] \\ & + [0,11 \cdot (f_1 + f_4 + f_9)/3] + [0,09 \cdot (f_{13})/1]. \end{aligned}$$

The second indicator (ICIOR) has been constructed similarly. It comprises six components (Table 9) to which the weights are assigned. The Alpha Cronbach coefficient for 22 factors/actions is 0,864 (Table 8).

**Table 8.** The Alpha Cronbach, KMO, and Bartlett tests – ICIOR (N=100)

Alpha Cronbach	Value	0,864
	Number of positions	22
Kaiser-Mayer-Olkin (KMO) measure of sample adequacy		0,787
Bartlett sphericity test	Approximated chi-square	638,280
	df	231
	p	<0,001

Source: own study.

**Table 9.** The total explained variance – ICIOR (N=100)

Component	Initial eigenvalues			Sums of load squares after rotation			Weight
	Total	% variance	% cumulated	Total	% variance	% cumulated	
C1	6,007	27,302	27,302	2,675	12,160	12,160	0,21
C2	1,743	7,925	35,227	2,515	11,433	23,593	0,20
C3	1,439	6,539	41,767	2,135	9,704	33,297	0,17
C4	1,269	5,767	47,534	2,031	9,233	42,529	0,16
C5	1,119	5,087	52,621	1,892	8,601	51,131	0,15
C6	1,092	4,966	57,587	1,420	6,456	57,587	0,11

Rotation converged in 10 iterations. Source: own study.

The indicator of the complexity of the importance of ensuring organizational resilience (ICIOR) has adopted the weighted average formula of all 22 factors:

$$ICIOR = [0,20 \cdot (5+6+11+21)/4] + [0,20 \cdot (7+8+9+16+22)/5] + [0,17 \cdot (2+3+10+13+18)/5] + [0,16 \cdot (4+19+20)/3] + [0,15 \cdot (12+14+15+)]/3 + [0,11 \cdot (1+17)/2].$$

In the further part of the article, analyses based on the values of constructed indicators will be presented.

### Results and discussion

Considering RQ1, it should be noted that the mean values of the indicator of the complexity of ensuring organizational resilience (ICAOR), as well as the indicator of the complexity of the importance of ensuring organizational resilience (ICIOR), are at a moderate level (values of both indicators are in

the range of 1–5), i.e., the mean for ICAOR is 3,3738, and for ICIOR – 3,3637 (Table 10). Therefore, it can be assumed that the complexity of ensuring organizational resilience and the complexity of the importance of ensuring organizational resilience is at a moderate level. It is also worth noting that this is reflected in the values of other descriptive statistics (Table 10). In addition, both indicators are left-skewed, which indicates that most of the respondents' ratings were above the mean.

To detail the above results, it can be made a reference to the division of the organizations into clusters. The study identified (using the *k*-mean method) three clusters of the organizations: (1) with low values, (2) with moderate values, and (3) with high values of both indicators. For both ICAOR and ICIOR, organizations with moderate values dominate – 65% and 63%. For both indicators, low-value organizations have the smallest share (5% and 3%) (Table 11).

**Table 10.** Descriptive statistics for the values of ICAOR and ICIOR (N=100)

Descriptive statistics	ICAOR	ICIOR	Descriptive statistics	ICAOR	ICIOR
Mean	3,3738	3,3637	Skewness	-0,283	-0,648
Median	3,3017	3,3052	Kurtosis	2,751	3,516
Dominant	2,94*	0,99*	Gap mark	3,89	3,96
Standard deviation	0,58816	0,63052	Min	1,00	0,99
Variance	0,346	0,398	Max	4,89	4,95

\* There are many modal values. The smallest value is specified. Source: own study.

**Table 11.** Clusters of organizations – according to the values of ICAOR and ICIOR (N=100)

		Clusters		
		Organizations with LOW values	Organizations with MODERATE values	Organizations with HIGH values
Attributes of organizations	Stand(ICAOR)	-2,38284	-0,33119	1,11471
	N (%)	5 (5%)	65 (65%)	30 (30%)
	Scale of operation	Local	Local, regional	Local
	Leading business profile (according to the number of departments of PKD classification)	Department: 61	Departments: 61, 62	Departments: 59 and 60, 63, 72
	Average annual turnovers (PLN million)	0–0,5	0–0,5, 0,5–1	0–0,5
	Age	“Young”, “mature”	“Young”, “mature”	“Relatively young”, “mature”
Attributes of organizations	Stand(ICIOR)	-3,35468	-0,37177	0,98487
	N (%)	3 (3%)	63 (63%)	34 (34%)
	Scale of operation	Local	Local	Local
	Leading business profile (according to the number of departments of PKD classification)	Departments: 61, 63, 72	Departments: 61, 62, 72	Department: 63
	Average annual turnovers (PLN million)	0–0,5	0–0,5, 0,5–1	0–0,5
	Age	“Relatively young”	“Mature”	“Young”, “relatively young”, “mature”

Source: own study.

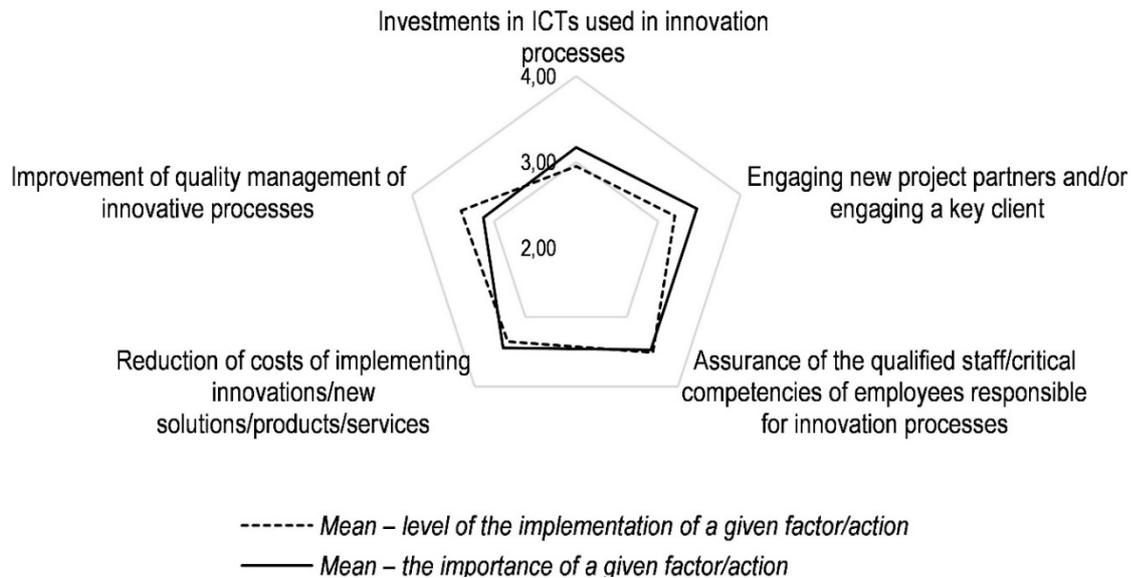
Focusing on RQ2, it is worth referring to four types of innovations, i.e., organizational, process, product, and marketing. For organizational innovation, the study identified eleven factors/actions. Figure 1 indicates that respondents similarly assessed the level of implementation and the importance of specific factors/actions. The differences in assessment identified are not significant. In the case of six factors/actions, respondents rated the importance higher than the implementation level – indicating that these factors/actions should be developed in organizations in the future. These are: improvement of control processes in the organization, application of risk management, improvement of employee motivation processes, stability of the workforce

(durability of employment), reduction of costs of recruiting employees, and assurance of the company's financial liquidity.

In the case of process innovations, five factors/activities are listed, for which the assessment of the level of implementation and the importance are at a similar level. However, in the case of the investments in ICTs used in innovation processes, reduction of costs of implementing innovations/new solutions/products/services, and engaging new project partners and/or engaging a key client, respondents rated the importance higher than the level of implementation (Figure 2). These areas need to be addressed and improved to strengthen the resilience of organizations.



**Figure 1.** Assessments of factors/actions in the area of organizational innovations (N=100)  
Source: own study.



**Figure 2.** Assessments of factors/activities in the area of process innovations (N=100)

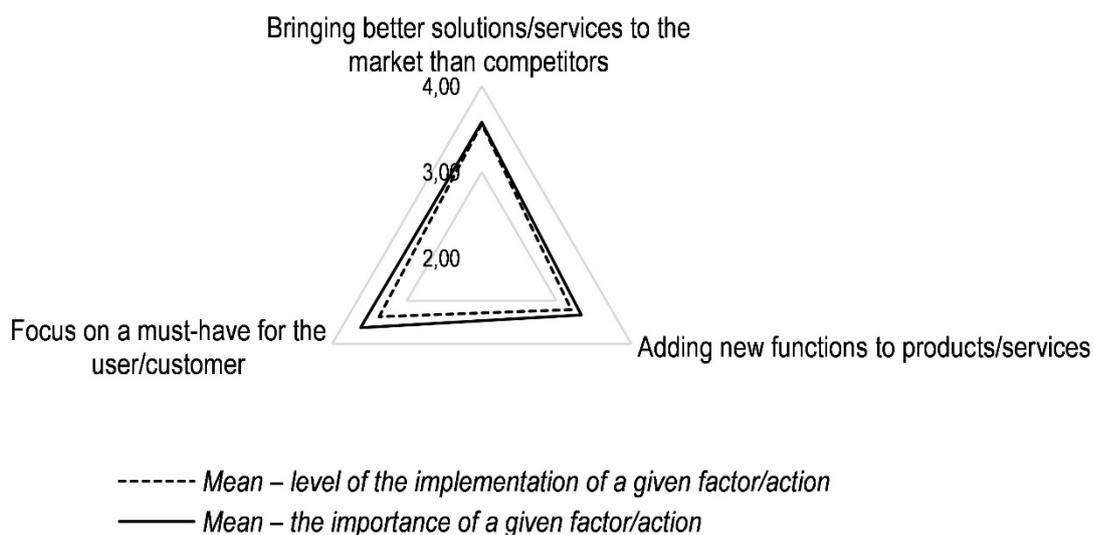
Source: own study.

In the case of product innovations, three factors/activities are listed, for which the assessment of the level of implementation and importance are at a similar level. For all factors/activities, respondents rated higher for the importance of these factors/activities in ensuring the organization's resilience than for the level of their implementation (Figure 3).

The last area – marketing innovations – considers three factors/activities for which the assessment of the level of implementation and importance are at a similar level. In the case of counteracting the activity of new competitors or weakening their activities, respondents rated the importance higher than the level of implementation

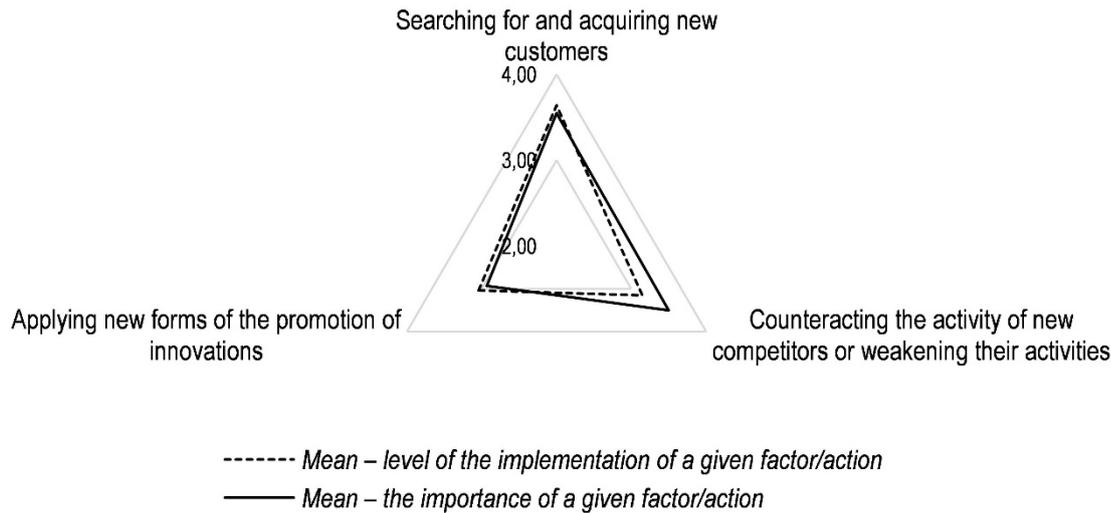
(Figure 4). This area needs to be addressed and improved to strengthen the resilience of organizations.

Summing up, there is a “gap” between respondents' assessment of the level of implementation of given factors/activities (in the area of creating innovations, increasing the level of innovativeness of the organization, and improving innovative processes), and the importance of the same factors/activities – in the context of ensuring organizational resilience. Importantly, this “gap” is not significant. However, some factors/actions require improvement/more comprehensive implementation in organizations.



**Figure 3.** Assessments of factors/activities in the area of product innovations (N=100)

Source: own study.



**Figure 4.** Assessments of factors/activities in the area of marketing innovations (N=100)

Source: own study.

Referring to RQ3, it can be noted that the essential attributes of organizations (age, average annual turnovers, scale of the organization's operations, and leading business profile) do not differentiate the way respondents assess the complexity of ensuring organizational resilience, as well as the

complexity of the importance of ensuring organizational resilience. The only case in which respondents differed statistically in their assessments is the ICIOR indicator for the criterion of the leading business profile of the organization (Table 12).

**Table 12.** Kruskal-Wallis test for independent samples – according to the values of ICAOR and ICIOR (N=100)

Indicator	H <sub>0</sub>	p	Decision
ICAOR	The ICAOR distribution is the same for all categories determined by the age of the organization.	0,743	No grounds for rejecting the H <sub>0</sub> hypothesis.
	The ICAOR distribution is the same for all categories determined by average annual turnovers.	0,905	
	The ICAOR distribution is the same for all categories determined by the scale of the organization's operations.	0,235	
	The ICAOR distribution is the same for all categories determined by the leading business profile of the organization.	0,133	
ICIOR	The ICIOR distribution is the same for all categories determined by the age of the organization.	0,866	Reject the H <sub>0</sub> hypothesis.
	The ICIOR distribution is the same for all categories determined by average annual turnovers.	0,953	
	The ICIOR distribution is the same for all categories determined by the scale of the organization's operations.	0,707	
	The ICIOR distribution is the same for all categories determined by the leading business profile of the organization.	0,032	

The significance level is 0,05. The asymptotic significance is presented. Source: own study.

The obtained research results align with the guidelines in the *Oslo Manual* publication (OECD/Eurostat, 2018), suggesting that the organization's development (and thus shaping its resilience) should be multifaceted – referring to product,

process, organizational, and marketing innovations. Respondents showed with their assessments that all four types of innovations (and the factors/activities supporting them) are essential in shaping organizational resilience. Therefore, the

results obtained are also consistent with the conclusions contained in the studies: Romanowska (2012), Dworzecki and Leśniak-Łebkowska (2018), Koziół-Nadolna (2019), Accenture (2019), de Moura et al. (2021), Kaçmaz and Çevirgen (2021), as well as Țiclău et al. (2021). This is because the respondents showed that individual factors/activities (listed based on these studies) supporting innovation and which may affect the organization's resilience are relatively essential and implemented in the surveyed organizations at a moderate level.

The research can be a source of specific guidelines for management practice. First, shaping organizational resilience should have a holistic dimension, i.e., considering different resources and processes. Combining the "static" approach with the "dynamic" approach is recommended. In addition, the resilience of innovative entities should not be identified only with the implementation of product innovations – process, organizational, and marketing innovations are also of great importance. Organizations must also attempt to assess the complexity of ensuring their resilience and value the factors/actions that may determine this resilience. It is also recommended to update the set of these factors/actions regularly. This involves integrating the "system" of shaping organizational resilience with the "mechanisms" of risk and security management.

## Conclusions

Pro-innovation activities can have an impact on shaping the resilience of an organization. Of course, there are many ways to increase the level of this resilience through the area of innovative processes. Each organization should find its

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solution in this regard. Studies have shown that the complexity of ensuring organizational resilience and the complexity of the importance of ensuring organizational resilience is at a moderate level. Moreover, there is a relatively small "gap" between respondents' assessment of the level of implementation of given factors/activities and the importance of the same factors/activities – in the context of ensuring organizational resilience. In addition, the essential attributes of the surveyed organizations do not differentiate the respondents' assessments in terms of the complexity of ensuring organizational resilience and the complexity of the importance of ensuring organizational resilience. The above results can be considered positive. However, the study has identified areas whose improvement could result in increased organizational resilience.

The primary research limitation was the relatively small research sample. Therefore, inference for the entire population was limited. In addition, it was necessary to use simplifications in the empirical research – due to the complexity of the research subject. Therefore, 22 factors/activities were selected, and detailed analyses were based on them. Further research should focus on assessing the organization's resilience level (e.g., in the opinion of respondents) and identifying correlations between individual pro-innovation activities and the organization's resilience level.

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