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USE OF ICTs IN FACILITATING ORGANIZATIONAL AGILITY BASED ON OWN RESEARCH

Celina M. OLSZAK[1*], Maria KOCOT[2], Artur KWASEK[3]

[1] University of Economics in Katowice; celina.olszak@ue.katowice.pl, ORCID: 0000-0002-3874-2830
[2] University of Economics in Katowice; maria.kocot@ue.katowice.pl, ORCID: 0000-0001-5150-3765
[3] University of Technology and Economics, Warsaw, Poland; artur.kwasek@uth.edu.pl, ORCID: 0000-0003-4386-1444
* Correspondence author

Purpose: The purpose of the paper is to explore the use of ICTs (Information and Communication Technology) in the development of organizational agility and to identify the attributes of an agile organization and its employees. The paper aims to provide conclusions and recommendations on the role of ICT s in creating organizational agility and the attributes of employees that are conducive to this development. The main research issue wastools determining the impact of ICTs on the development of organizational agility. The hypothesis suggested a significant impact of ICTs usage on the development of organizational agility, characterized by employees who actively use these tools and exhibit traits that aid this development.

Design/methodology/approach: An empirical study was conducted, involving 930 randomly selected respondents from small, medium, and large enterprises. The questions were directed at both managers and operational employees. The survey was conducted in February/March 2022 using the CAWI (Computer Assisted Web Interviewing) technique.

Findings: Organizational agility is a crucial organizational competency that is becoming key to improving organizational effectiveness, gaining a competitive edge, and navigating a turbulent environment.

Organizational agility is the mechanism through which organizations can generate significant, sustainable value for their diverse stakeholders.

Organizational agility is achieved through the appropriate development and utilization of human capital. Employee agility is a fundamental pillar of organizational agility, so organizations should prioritize its development.

The development of organizational agility should be facilitated by ICTs. These tools aid in enhancing communication, collaborative work, remote work, decision-making, and project management.

Research limitations/implications: The research was limited to the 930 respondents from various enterprise sizes, and the time frame was February/March 2022. Further research could explore different time frames and expand the pool of respondents.

Practical implications: Organizations aiming for agility could focus on the development and utilization of ICTs and prioritize employee development programs that encourage traits conducive to organizational agility.

Social implications: The research shows that ICTs and employee agility contribute to organizational agility. This could influence educational programs to prioritize digital literacy and adaptability, potentially affecting workforce culture and public policy.
Originality/value: The study offers a fresh perspective by concurrently analyzing organizational agility from the standpoints of management science and information technology. A theoretical model for utilizing ICTs to foster organizational agility is also presented.

Keywords: ICTs, organizational agility, organization, agile employees, supporting organizational agility.

Category of the paper: research paper.

1. Introduction

The need for flexible and innovative management components in modern organizations has been evident for many years. However, it has recently gained particular significance. This has led to the issue of organizational agility receiving increasing attention, both among theorists and representatives of business practice (Homrozi, 2009; Yang, 2014; Liu, 2012; Trzcielinski, 2007; Sahota, 2012). Organizational agility is believed to be a means to survive and thrive in a competitive, turbulent, and unpredictable environment (Kidd, 1994; Andoh-Baidoo, 2016; Doz, Kosonen, 2008; Quereshi, 2016). It is emphasized that it helps to respond swiftly and efficiently to any market changes (Ravichandran, 2018), to quickly identify customer needs, and to offer them customized solutions for their highly personalized needs (Sanchez, Nagi, 2001; Teece, 2000; Rigby, 2000). In other words, organizational agility is becoming a way for organizations to function effectively (Narasimhan et al., 2006).

Recently, a key issue has become the search for various tools and technologies that could contribute to the support and development of organizational agility (Doz, Kosonen, 2008; Homrozi, 2009). The volume of information and events that need to be collected, analyzed, and explored for the management of today's organization prompts the use of ICT (Information and Communication Technology) tools. Unfortunately, there is limited theoretical and practical research devoted to the possibility of supporting organizational agility using ICT. So far, it has not been possible to determine, among other things, the strength of the impact of various ICTs on the development of organizational agility, as well as the areas of its support.

The purpose of this paper is to explore the use of ICTs in the development of organizational agility and to identify the attributes of an agile organization and its employees. The paper aims to provide conclusions and recommendations on the role of ICTs in creating organizational agility and the attributes of employees that are conducive to this development. The main research issue was determining the impact of ICTs on the development of organizational agility. It was hypothesized that the use of ICTs significantly impacts the development of organizational agility, with employees who actively use these tools exhibiting characteristics

that contribute to this development. In order to explore this issue in depth, the following research questions were formulated:

1. What ICTs are most commonly used in organizations?
2. What is the impact of ICTs on the development of organizational agility?
3. In which areas of the organization's operations do ICTs most strongly support and develop organizational agility?
4. What factors and attributes of employees influence the development of organizational agility using ICTs?

In order to realize the research objective formulated in this way and answer the questions posed above, a literature study was conducted, as well as empirical research. First, the essence of organizational agility was characterized, and the attributes of employees that contribute to its development were described. In addition, numerous arguments are given, demonstrating the key role of ICT in supporting organizational agility.

An important part of this study is the empirical research, which aimed to identify the relationship and determine the strength of the impact of ICT on the development of organizational agility. The research was conducted in February/March 2022 on a sample of 930 respondents using a survey questionnaire. The results of the questionnaires were compiled, following the standard CAWI technique.

The present research also identified key skills and attributes of employees, determining the development of organizational agility.

The novelty and originality of this study lie in the presentation of a research approach to determine the impact of ICTs on the development of organizational agility. Previous research presented in the literature has mainly focused on two unrelated approaches: the development of organizational agility and the use of ICT in organizations. In contrast, the present research integrates these two research streams, derived from management science and computer science, thus making it possible, among other things, to determine the level of impact of ICTs on the development of organizational agility. This provides a new insight that not only enriches the scientific literature on organizational agility but also offers valuable insights for organizations and their employees on the role of ICT in the development of organizational agility. The original culmination of this discussion is the proposal of a theoretical model for supporting organizational agility using ICTs.

2. Literature Review

2.1. The essence of organizational agility

The volatility of the environment, the accelerating pace of digitization, and dynamic technological development necessitate that modern organizations exhibit agility and flexibility. In the literature, the concept of organizational agility is interpreted in various ways (Table 1). Many authors (Kidd, 1994; Yang, Liu, 2013; Trzcielinski, 2007) argue that it is the ability of an organization to respond quickly to market changes, recognizing customer needs (Sanchez, Nagi, 2001; Rigby, 2000) and identifying emerging opportunities and threats (Almahamid, Awwad, 2010; Goldman, Nagel, Preiss, 1995; Sahota, 2012).

Organizational agility is also equated with an organization's ability to provide quality products, innovate, and personalize products and services (Doz, Kosonen, 2008; Rigby, 2000).

Organizational agility is sometimes understood as the ability to act adaptively (Homrozi, 2009; Zarczyńska-Dobiesz, 2008), as well as proactively (Sanchez, Nagi, 2001; Rigby, 2000). The former refers to the process of rapid adaptation of an organization to market requirements. The latter, however, is the ability to intelligently anticipate changes and consciously and subconsciously modify various behavior patterns in order to solve business problems more effectively (Homrozi, 2009; Zarczyńska-Dobiesz, 2008).

Many authors (Kidd, 1994; Bray, 2019; Homrozi, 2007) believe that organizational agility is a way to survive and cope in a competitive, turbulent, and unpredictable environment. It is emphasized that it helps to respond instantly and effectively to any market changes (Goldman, Nagel, 1995; Sahota, 2012), to quickly identify customer needs, and to offer customized solutions to meet their highly personalized needs (Sanchez, Nagi, 2001; Teece, 2007; Rigby, 2000). In other words, organizational agility becomes a way for organizations to operate more efficiently (Goldman 1995; Narasimhan, 2006; Zhang, Sharifi, 2000; Meredith, Francis, 2000; Bessant et al., 1999; Leberecht, 2016; Gunasekaran, 1998; Cappelli, 2018).

According to some authors (Goldman, 1995; Heer, 2012), organizational agility is the ability to assimilate different production technologies and personnel to meet market changes. Organizational agility is sometimes also equated with shrewdness, understood as the ability to identify market opportunities, as well as resilience, which can be interpreted as effectively coping with broad adversity and functioning under stressful conditions (Sumukadas, Sawhney, 2012). Organizational agility is likened to intelligent reasoning, meaning the ability to deal with situations for which there are no clearly defined rules of conduct (Gunasekaran, 1999; Sajdak, 2014; Doz, Kosonen, 2008). In concluding the consideration of the essence of organizational agility, it's worth noting that the development of organizational agility is determined by many components. Undoubtedly, a flexible organizational structure that allows for a rapid response to a variety of changes plays an important role (Uhl-Bien, Arena, 2017). The importance of an organizational culture that promotes innovation and openness to change (O'Reilly, Tushman,

2013), which are key to the development of organizational agility, is also emphasized. In addition, it is argued that flexible management processes that enable rapid adaptation and agile decision-making (Sull, Homkes, Sull, 2015) promote the development of organizational agility. Having agile human capital, i.e., employees who are open to collaboration and communication, is also an important element for the development of organizational agility (Gallup, 2016).

A review of the literature on the interpretation of the term "organizational agility" allows us to conclude that organizational agility is a multidimensional category, referring to the various skills and capabilities of an organization that enable it to operate efficiently in an unpredictable environment, respond quickly to changes occurring in the market, recognize opportunities and threats, and assimilate various technologies.

2.2. Attributes of agile employees

Closely related to the concept of organizational agility is the term ‘employee agility' (Sambamurthy, Bharadwaj, Grover, 2003). This concept is interpreted through the prism of various attributes, such as resilience, responsiveness, adaptability, proactivity, generativity, and intelligence (Doz, Kosonen, 2008).

It is believed that an agile employee is a resilient one. 'Resilience' is important in grappling with various problems that may occur, for example, during the execution of work. A resilient employee is oriented toward learning and self-development. They are also willing to solve problems quickly, eager to take on new responsibilities, and able to cope with change. It is argued that a resilient employee is a person who has the ability to apply new technologies, as well as the ability to create innovative ideas and accept new responsibilities (Krull, Mackinnon, 2016; Thalassinos, 2020; Doz, Kosonen, 2008; Breu, 2002; Nath, Agrawal, 2020).

An agile employee is also characterized by the ability to respond quickly to changes in the market (Gunasekaran, 1999; Sharifi, Zhang, 1999; El-Wakeel, 2019). Such a capability can be achieved by systematically conducting strategic analysis, creating early warning systems, and, most importantly, developing in-house effective methods of searching for market opportunities (Sambamurthy, Bharadwaj, Grover, 2003; Yin, 2020).

An attribute of an agile worker is adaptability, i.e., the ability to adjust to new situations, tasks, and roles, as well as the ability to work in teams, use new technologies, and implement new work procedures (Felipe, Leander, 2020, pp. 575-619; Galvin, 2019, pp. 1-13).

Another attribute of an agile worker is proactivity, which is related to the ability to initiate and implement new creative activities, as well as to anticipate unexpected situations (Sanchez, Nagi, 2001; Rigby, 2000).

An attribute of an agile employee is also generativity, which means activity, initiative, and continuous learning of employees through experiences acquired in the course of work (Sahota, 2012; Shahin, Nikjoot, Nilipour, 2011). In turn, intelligence helps to respond quickly to customer needs and changing market conditions (Dyer, Shafer, 2003; Heer, 2012; Rigby, Elk,

Berez, 2020). In conclusion, it is worth emphasizing once again that organizational agility is a multidimensional construct, referring to both human characteristics and the organization as a whole. These spheres are closely interrelated. This is because organizational agility is achieved through the development and use of human resources endowed with agile attributes. Employees, possessing certain qualities and skills, are able to adapt to changing conditions and respond quickly to new challenges. Their savvy, adaptability, resilience, and proactivity allow the organization to operate effectively in a dynamic business environment (Figure 1).

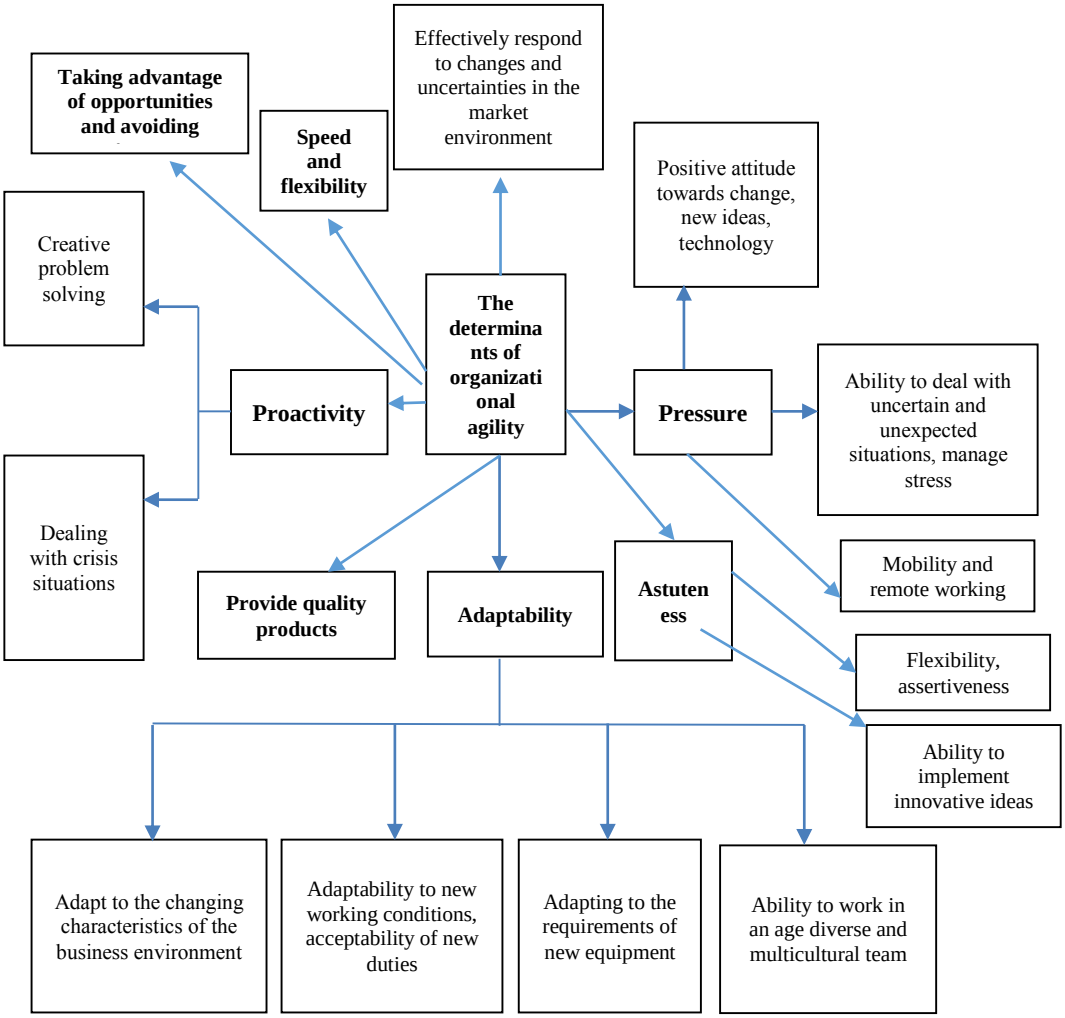

Figure 1. The determinants of organizational agility.

Source: own.

2.3. Use of ICTs in agile organizations

One of the essential features of an agile organization is the assimilation of various technologies, including the ability to effectively use modern ICTs (Bray, Reeves, Levin, Harnoss, Ueda, Kane, Johnson, Billespie, 2019, pp. 1-23; Cappelli, Tavis, 2018, pp. 46-52; Zhen, Xie, Dong, 2021, pp. 100-501). These tools are a broad concept, encompassing, on one hand, a variety of applications and complex integrated systems that allow for the efficient acquisition, collection, processing, analysis, transmission, and visualization of a variety of data

to support decision-making at various levels of management, as well as to support various business processes, such as customer and supplier relationship management (Chen, Chiang, Storey, 2012). On the other hand, ICTs, unlike traditional IT tools, cover the entire spectrum of media focused on communication, cooperation, and collaboration. These include, but are not limited to, the Internet, intranets, extranets, collaborative work systems, emails, chat rooms, social media platforms, video conferencing tools, and mobile and wireless networks (Turban et al., 2018). ICTs can also include computer hardware such as servers, workstations, smartphones, tablets, routers, and other devices (Tanenbaum, Wetherall, 2011).

The era of ICT development, which began in the 1960s, was mainly based on the principles of simple automation and supporting simple, operational activities of organizations. Today, the role of ICT has changed dramatically. ICT is used for, among other things: (1) developing modern strategies and business models; (2) creating sources of competitive advantage; (3) making fundamental transformations in organizations; and (4) integrating and developing the entire ecosystem. It is even claimed that they have become a strategic tool for economic growth, determining the competitiveness of many organizations and their innovative development (Drucker, 2014; Nonaka, Takeuchi, 1995; Tan, Steinbach, Kumar, 2005; Steiger, 2010). They can be used in virtually every sector of the economy and industry (Olszak, 2020; Olszak, Zurada, 2020; Olszak, Kisiołek 2020).

However, the use of ICTs in organizations requires competent, highly skilled, and agile employees (Martucci, de Felice, Schitone, 2012). Agility in the ICT area is particularly important, as it provides an opportunity to, among other things, introduce innovative solutions (in the form of new products and services), as well as improve communication, increase organizational agility, improve management processes, and improve customer service and optimize logistics chains (Nieves, Osorio, 2013; Mithas, Ramasubbu, Sambamurthy, 2011).

3. Materials and methods

The primary aim of this study is to ascertain the influence of ICT on the enhancement of organizational agility. An empirical study was conducted involving 930 randomly selected respondents representing small, medium, and large enterprises. Both managers and operational employees were surveyed. The research was carried out between February and March 2022 using a survey questionnaire. The CAWI (Computer-Assisted Web Interviewing) technique was employed, allowing for easy and widespread access to respondents via the Internet. The survey resulted in 930 completed questionnaires.

The study collected information on various sociodemographic aspects of the respondents. The data referred to the gender of the respondents. In the study group, women accounted for 61.7% and men for 38.3%. The largest age group was under 25 (66.1%), followed by 26-35

(18.1%), 36-45 (11.2%) and over 45 (4.6%). As for positions, top management was held by 5.8% of respondents, middle management by 10.9%, low management by 14.1%, and operational employees accounted for 69.2%. The size of the companies where the respondents worked was distributed among micro-enterprises (21.3%), small enterprises (21.6%), medium-sized enterprises (18.1%) and large enterprises (39.0%).

The respondents represented various industries. The largest group was represented by those associated with the transportation, communications, utilities, housing and trade sectors, which accounted for 33.7% of respondents. Another significant group was represented by employees in the financial, insurance, marketing, advertising and real estate sectors, who accounted for 31.9% of the survey sample. Health care, social welfare, education, research, tourism, recreation, government, justice, police and military represented another segment of respondents, accounting for 23.2% of the total number of respondents.

4. Research results

The research conducted, first of all, made it possible to identify the perception of the term "organizational agility" by the surveyed respondents. Analyzing the answers to the open-ended questions addressed to the respondents, two conclusions emerge. First, from an organizational perspective, organizational agility is identified primarily with:

- the organization's ability to respond quickly to change,
- rapid identification of opportunities and threats,
- identification of customer needs,
- ability to adapt to new situations,
- innovation and creativity of the organization,
- building the organization's culture and efficient management of human resources,
- ensuring quality products,
- ability to operate the organization in a changing environment,
- the ability to respond to crisis situations,
- ability to use modern ICT technologies.

In turn, from the perspective of employee attributes, the term "organizational agility is associated primarily with: commitment, dedication, reliability and open-mindedness, competence and creativity. At the same time, no definite importance was indicated for innovation and risk management skills (Table 1).

Table 1.
Interpretation of organizational agility, N = 930

	Definitely NO	Rather NO	I have no opinion	Rather YES	Definitely YES
Competence	2.15%	5.81%	4.62%	48.39%	39.03%
Innovation	3.33%	13.55%	15.38%	46.24%	21.50%
Creativity	3.23%	12.15%	11.72%	41.08%	31.82%
Open-mindedness	2.90%	8.82%	10.64%	40.75%	36.88%
Commitment	1.18%	2.90%	4.62%	33.33%	57.96%
Dedication	2.69%	6.56%	11.72%	37.10%	41.94%
Ability to manage risks	6.02%	15.48%	20.54%	33.87%	24.09%
Credibility	2.15%	4.94%	11.29%	39.35%	42.26%
Ingenuity	3.55%	9.14%	12.37%	46.45%	28.49%

Source: own.

The assessment of the surveys has identified the most important ICTs that support organizational agility. The results of the survey are presented in Table 2.

Table 2.
Most commonly used ICTs to support organizational agility, N = 930

Databases	650	18.60%
Spreadsheets	593	16.90%
Mobile technologies	408	11.70%
Social networking	362	10.30%
Corporate portals	297	8.50%
Data visualization tools	266	7.60%
Data warehouses	208	5.90%
Business intelligence and Big Data	204	5.80%
Cloud computing	171	4.90%
Internet of Things	128	3.70%
Artificial intelligence	116	3.30%
Other	97	2.80%
Total	**3500**	**100.%**

Source: own.

In this question, respondents had the option to answer more than one question, hence 3500 responses were obtained. It turned out that the most frequently used technologies are: databases, spreadsheets, mobile technologies and corporate and social networks. A certain surprise is the poor result of the very fashionable solutions of today: Business Intelligence and Big Data, Cloud Computing, Internet of Things and Artificial Intelligence.

An important part of the quantitative survey was an attempt to determine the degree of influence of ICTs on creating organizational agility, using a Likkert scale of 1-5. The results of the responses are presented in Figure 2.

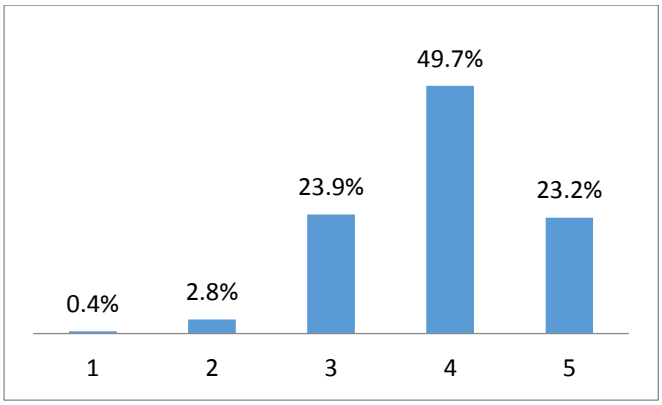

Figure 2. Assessment of the impact of ICT on organizational agility, N = 930.
Source: own.

The above survey confirmed the significant impact of ICT on organizational agility at an average level of 3.92 for the 1-5 scale used, resulting in 462 responses for a score of 4 and 216 responses for a score of 5, respectively.

In conducting the research, an effort was made to identify areas of the organization's operations where ICTs most strongly support and develop organizational agility (the third research question). Table 3 presents the research results.

Table 3.
ICT application areas supporting organizational agility, N = 930

Communication	614	12.1%
Group work	602	11.8%
Remote work	530	10.4%
Decision making	496	9.7%
Project management	459	9.0%
EDI - electronic document workflow	381	7.5%
CRM - customer relationship management	357	7.0%
E-commerce	333	6.5%
E-business	330	6.5%
Virtualization of business processes	260	5.1%
SCM - supply chain management	244	4.8%
Networking	238	4.7%
B2B or B2C	198	3.9%
Other	50	1.0%
Total	**5092**	**100%**

Source: own.

5092 responses were obtained, which is the result of the ability of a group of 930 respondents to provide any number of answers. In interpreting the results of the survey, it should be noted that the most common areas of ICT applications supporting organizational agility include: communication, group work, remote work, decision-making and project management. Only in the next place were indicated: EDI, CRM, or E-commerce.

Based on the review of the results shown in Table 4, it can be concluded that agile workers will contribute to organizational agility. Communication, teamwork, remote working, decision-making and project management are often identified as key areas where ICTs support organizational agility. Agile employees who use these tools have a greater ability to

communicate effectively, make decisions flexibly, work in teams and manage projects. Tools such as electronic workflows, customer relationship management, e-commerce and business process virtualization also help improve organizational agility by streamlining operations and customer interactions. Thus, it can be concluded that agile employees, through the use of ICTs, tend to develop organizational agility.

In seeking answers to the fourth research question, regarding factors and employee attributes affecting the development of organizational agility using ICTs, it is important to note the results shown in Table 4.

Table 4.
Factors and attributes that develop organizational agility, N = 930

	Yes	No	Don't know
Flexibility	86.77%	4.73%	8.49%
Assertiveness	63.55%	19.03%	17.42%
Mobility and remote working	79.68%	12.47%	7.85%
Ability to solve problems	89.57%	3.12%	7.31%
Adaptability to new working conditions	88.06%	4.41%	7.53%
Ability to implement innovative ideas	65.48%	12.26%	22.26%
Acceptability of new responsibilities	83.01%	6.67%	10.32%
Ability to work in an age diverse team	86.02%	6.67%	7.31%
Ability to work in a multicultural environment	74.41%	9.46%	16.02%

Source: own.

In this survey, respondents could confirm, deny or give an answer of "I don't know" in the context of personality traits that affect organizational agility. The majority of responses indicated positively, with problem-solving skills, adaptability, flexibility and the ability to work in an age-diverse team being the most common, while assertiveness received the least attention.

In this study, cross-correlations were also determined between such variables as management effectiveness using ICT, innovation, creativity, open-mindedness, commitment, dedication, risk management skills, and reliability and resourcefulness. For this purpose, the Pearson correlation coefficient was used, which is one measure of the linear relationship between the following variables. The obtained correlation coefficients are shown in Table 5.

Table 5.
Correlation between variables

Variables		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Management efficiency using ICTs	**1**	**1**								
Innovation	**2**	0.876	**1**							
Creativity	**3**	0.984	0.927	**1**						
Open-mindedness	**4**	0.991	0.865	0.988	**1**					
Commitment	**5**	0.873	0.562	0.828	0.901	**1**				
Dedication	**6**	0.959	0.766	0.945	0.983	0.959	**1**			
Ability to manage risks	**7**	0.859	0.951	0.932	0.890	0.652	0.834	**1**		
Credibility	**8**	0.968	0.787	0.953	0.988	0,948	0.999	0.844	**1**	
Ingenuity	**9**	0.965	0.969	0.983	0.956	0.738	0.892	0.940	0.908	**1**

Source: own.

The value of the correlation coefficient should have been determined in the range from -1 to 1. Table 6 shows the strength of the correlation between variables 1,2,3,4,5,6,7,8,9. The value of the correlation coefficient can take a value from -1 to 0 (which means a negative linear correlation between the two variables), 0 (which means no linear correlation between the two variables) or 0 to1 (which means a strong positive linear correlation between the selected variables). The further the correlation coefficient deviates from zero, the stronger the relationship between the two variables.

In the above study, most of the correlation coefficients are between 0.8 and 1, which indicates an extremely strong positive relationship between the variables under study. Analyzing the results of the study, it can be seen that management effectiveness using ICTs had a strong positive correlation with innovation, creativity, open-mindedness, commitment, dedication, ability to manage risk, trustworthiness and ingenuity. All of these employee characteristics showed a high correlation with each other, suggesting that organizations that effectively use ICTs in management are more innovative, creative, open-minded to new ideas and committed. These results therefore confirm that organizational agility is closely related to effective management using ICTs and employee characteristics. The better an organization uses ICT, the greater the tendency to develop traits related to organizational agility.

Additionally, based on data from Table 5, a remarkably strong correlation can be observed between "Credibility" and "Commitment" (correlation coefficient of 0.999). This indicates that employees who are perceived as credible also exhibit a high level of commitment in their work. Such a high correlation may imply that these two attributes are inseparable and can be key factors of success for the organization. Also, the correlation value between "Creativity" and "Inventiveness" (0.983) indicates a very strong relationship between these two variables. This hints that creative employees are often also inventive, which is essential for creating innovative solutions within an organization.

Moreover, it is worth highlighting the correlation between "Innovation" and "Risk Management Ability" (0.951), suggesting that more innovative companies also exhibit better effects in risk management. This is particularly relevant in a turbulent market environment where risk management is a key element in maintaining competitiveness.

Finally, it should be noted that the "Efficiency of Management Using ICTs" shows a strong correlation with all other variables. This suggests that effective use of Information and Communication Technology (ICT) is fundamental in supporting innovation, creativity, open-mindedness, commitment, risk management skills, credibility, and inventiveness within an organization. This underlines the role that ICT plays in modern management and the development of organizations.

The analysis of the survey results allows for a positive verification of the research hypothesis presented. Above all, as the results from Table 1 suggest, a significant majority of respondents perceive organizational agility as a vital concept, with features such as innovation, creativity, and open-mindedness being emphasized.

An important finding is that ICTs, such as databases, spreadsheets, or mobile technologies, are commonly used by respondents (Table 2). This indicates that these tools can play a significant role in facilitating and supporting organizational agility.

ICT application areas, such as communication, teamwork, or remote work, which were most frequently indicated by respondents (Table 3), are areas that can directly influence the agility of the organization, enabling efficient responses to changes.

Results presented in Table 4 confirm that flexibility, problem-solving ability, adaptability to new working conditions, and the ability to work effectively in age-diverse teams are assessed as crucial for organizational agility. This demonstrates that ICTs can support the development of these features in organizations.

Lastly, Table 5 illustrates strong correlations between the efficiency of management using ICTs and the other characteristics studied. This points to the possibility that the use of ICT can not only contribute to organizational agility but also stimulate other features such as innovation or creativity.

In conclusion, the results of the analysis demonstrate that ICTs can play a key role in promoting organizational agility, thereby confirming the research hypothesis posed.

5. Discussion

The research conducted confirms the significant impact of ICTs on the development of organizational agility. Organizations that effectively use ICTs are better able to respond to change, identify opportunities and threats, create innovative solutions, communicate effectively, and manage projects effectively. It is worth noting that employee qualities such as commitment, creativity, and flexibility, and problem-solving skills play an important role in creating organizational agility. Organizations should, therefore, strive to recruit, train, and encourage employees to develop these qualities in order to make full use of them in the development of organizational agility.

It is also worth noting that modern ICTs such as Business Intelligence, Big Data, Cloud Computing, and the Internet of Things have been used to a very limited extent for the development of organizational agility. This may be due to various factors, such as a lack of awareness among users of their potential, difficulties in implementing them, or financial constraints.

It should also be noted that there is a strong correlation between the use of ICTs and organizational traits such as innovation, creativity, open-mindedness, and the ability to manage risk. Effective use of ICTs can help improve these traits and strengthen organizational agility. The theoretical considerations and the empirical research carried out lead us to propose the author's model for supporting organizational agility using ICTs (Figure 2). This model was

developed based on the analysis of the conducted research results (Table 2, 3, 4, 5, 6). The model requires further validation and implementation in selected organizations.

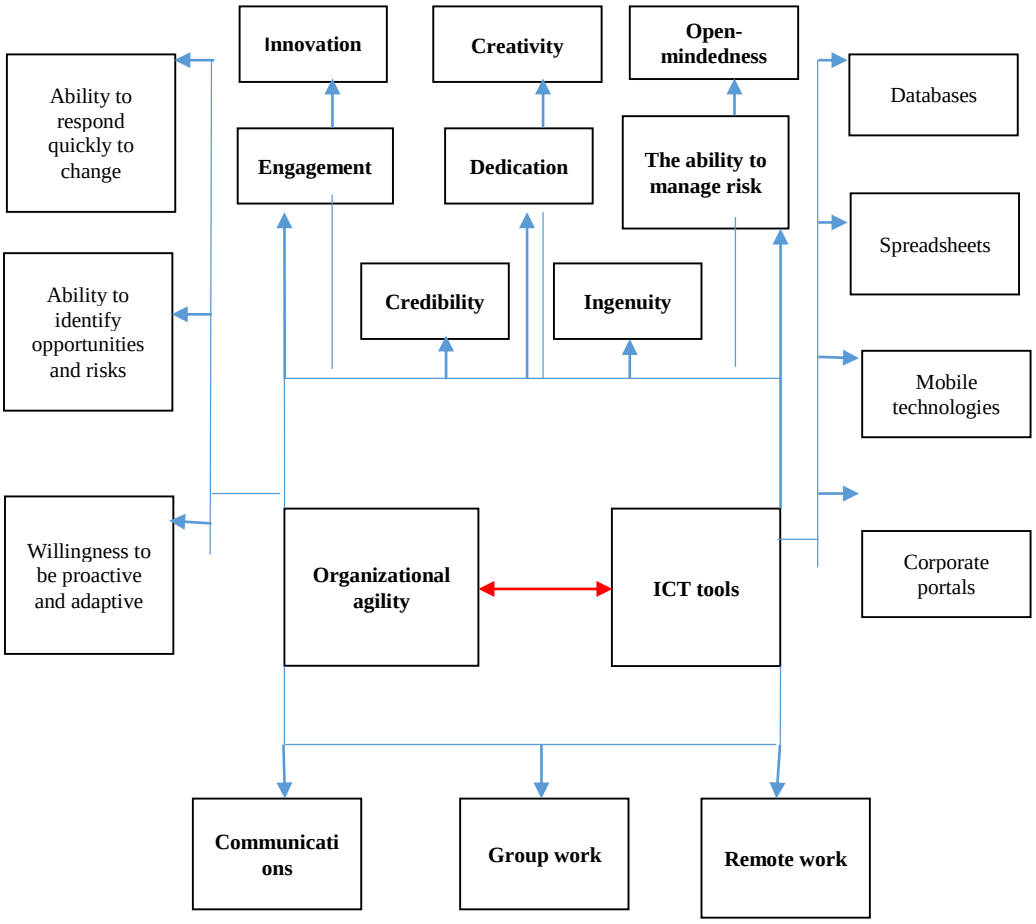

Figure 3. Model of supporting organizational agility with the use of ICTs.
Source: own.

The analysis of Figure 3 allows us to conclude that organizational agility refers to a company's ability to proactively and adaptively respond to changing circumstances. It is complemented by the ability to identify opportunities and threats, allowing the company to quickly react to changes. Such traits are essential for organizations that aim to succeed in an uncertain and dynamically changing business environment.

Agile attributes, such as innovativeness, creativity, open-mindedness, risk management skills, engagement, commitment, ingenuity, and credibility, play a crucial role in enhancing organizational agility. For instance, organizations that are innovative and open to new ideas are typically better prepared to adapt to changes. Similarly, engagement and commitment can lead to higher performance and better risk management, which also enhances agility.

ICTs, such as databases, spreadsheets, mobile technologies, and corporate portals, can enhance an organization's agility by facilitating access to information, increasing communication efficiency, and enabling better resource management. For example, databases can help organizations in identifying opportunities and threats, while mobile technologies can allow for faster response to changes.

ICT application areas that support organizational agility include communication, teamwork, and remote work. Communication is crucial for effective management and decision-making, and ICTs can enhance its efficiency. Teamwork and remote work are also facilitated by ICT, allowing for greater flexibility and adaptability to changes.

In summary, organizational agility is strongly linked with agile attributes, ICTs, and their applications. The effective use of ICT can increase organizational agility by facilitating access to information, increasing communication efficiency, and enabling better resource management. Agile attributes, such as innovativeness, creativity, open-mindedness, and risk management skills, are also key to enhancing agility. Therefore, organizations should focus on developing these attributes and effectively using ICT to boost their agility.

It could also be insightful to contrast some of the outcomes from this investigation with the results achieved by other scholars in the field. In a study conducted by Lu & Ramamurthy (2011) on organizational agility, respondents also identified agility as an organization's ability to respond to change, adapt to new situations and be creative. These findings are in line with those of the authors of this study. A study by Sherehiy & Karwowski (2014) on employee characteristics that support organizational agility indicated that commitment, creativity and flexibility are key characteristics that foster organizational agility. These findings are consistent with those of the authors.

6. Conclusions

The analysis of the literature on the essence of organizational agility and its determinants, as well as the empirical research conducted in selected organizations with a sample of 930 respondents, leads to the following conclusions and recommendations:

Firstly, respondents perceive organizational agility primarily as the ability to respond quickly to change, the ability to identify opportunities and threats, and a willingness to take proactive and adaptive actions.

Secondly, the research conducted indicates a strong relationship between the use of ICT and the development of organizational agility. Respondents mainly pointed to the important role of ICTs such as databases, spreadsheets, mobile technologies, and corporate portals.

Thirdly, organizational agility supported by ICTs is developing especially in areas such as communication, teamwork, and remote working.

Fourthly, organizational agility is strongly correlated with employee characteristics, especially problem-solving skills, flexibility, and adaptability. In other words, the development of agile organizations largely depends on innovative, creative, and open-minded people with competence in the use of ICTs.

Fifthly, a survey of various industries found that organizational agility is mainly associated with employee characteristics such as commitment, dedication, trustworthiness, open-mindedness, competence, and creativity. The most commonly used ICTs to support organizational agility are databases, spreadsheets, mobile technologies, social networks, and corporate networks. Taking innovation and risk management skills into account proved less important. Different industries are using different ICTs to improve processes and management methods. For example, the transportation and trade sector uses monitoring, trading platforms, and mobile applications, while the financial sector uses databases and spreadsheets to analyze financial data and manage customers. The size of the organization can make a difference in this aspect, with larger organizations having more financial and technological resources. Thus, organizational agility and the use of ICTs depend on the characteristics of the employees, the type of tools used in the industry, and the size of the organization.

The analysis and research conducted authorize the following recommendations and implications for business and organizational management:

1. Organizational agility is a crucial organizational competency that is becoming key to improving organizational effectiveness, gaining a competitive edge, and navigating a turbulent environment.
2. Organizational agility is the mechanism through which organizations can generate significant, sustainable value for their diverse stakeholders.
3. Organizational agility is achieved through the appropriate development and utilization of human capital. Employee agility is a fundamental pillar of organizational agility, so organizations should prioritize its development.
4. The development of organizational agility should be facilitated by ICTs. These tools aid in enhancing communication, collaborative work, remote work, decision-making, and project management.

This study presents a novel perspective on the issue of organizational agility development, analyzing it in parallel from the perspective of two major research streams, namely: management science and information technology. Previous works have not sufficiently exposed the impact of ICTs on the development of organizational agility. Thus, this study is an innovative approach to this issue, taking into account the role of ICT and employee characteristics. A unique aspect is the theoretical model of using ICTs to promote organizational agility.

Finally, it is worth addressing the limitations of the proposed research tool. First of all, it should be noted that the research took place during the coronavirus pandemic. The authors did not have the opportunity to meet the respondents in person and conduct in-depth interviews, which can be considered a significant limitation of the present study. Besides, mainly Polish companies were invited to participate in the study.

It is therefore important to continue the research in order to expand the knowledge of organizational agility and its impact on organizational performance. Future research should take into account different sectors and types of organizations in order to gain a more comprehensive understanding of this issue. Further research on the topic undertaken would also require identifying critical factors determining the development of organizational agility, as well as identifying key barriers to it.

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Appendix

Survey: Organizational agility as a determinant of effective use of ICT in the implementation of social innovation

Dear All!
I kindly request you to fill out a questionnaire, the purpose of which is to study the readiness of organizations to effectively use ICT in the implementation of innovations. The collected material will be used to develop a scientific article.

Thank you in advance for your time
Dr. Artur Kwasek

Metrics questions

1. Gender:
Female
Male

2. Age:
Under 25 years old
26-35 years old
36-45 years old
Over 45 years old

3. Position held:
top management
middle management
low-level management
employee

4. Seniority:
up to 5 years
6 - 10 years
11 - 15 years
16 - 20 years
over 20 years

Questions about your company

5. Size of your company:
Micro enterprise (less than 10 employees)
Small enterprise (10-50 employees)
Medium enterprise (50-250 employees)
Large enterprise (more than 250 employees)

6. What sector of the economy does your company operate in:
Sector 1 - agriculture, forestry, fishing.
Sector 2 - mining, quarrying and processing, and construction.
Sector 3 - transportation, communications, utilities, housing and commerce.
Sector 4 - finance, insurance, marketing and advertising, and real estate.
Sector 5 - health care, social welfare, education, scientific research, tourism and recreation, government, justice, police and military.

7. The company is in business:
less than 1 year
1 to 3 years
from 4 to 7 years
more than 8 years

8. Type of business conducted (multiple choice question):
Production
Trade
Services

9. Geographic scope of the company's operation:
Local
Regional
National
International

10. Financial situation of the company:
Very good
Good
Bad
Very bad
Hard to say

11. How would you rate your competence in using information and communication technologies (ICT)? (scale of 1-10)

12. How do you rate your ability to adapt to rapid changes? (scale of 1-10)

13. In your ongoing projects, are you able to: (Likert cafeteria)

	Definitely NO	**Rather NO**	**I have no opinion**	**Rather YES**	**Definitely YES**
Manage the project					
Be a leader (leadership)					
Achieve the set goals within the set time frame					
Achieve the set goals within the set budget					
Execute several projects simultaneously					
Manage a project team					

14. Is your consideration in the workplace: (Likert cafeteria)

	Definitely NO	Rather NO	I have no opinion	Rather YES	Definitely YES
Competence					
Innovation					
Creativity					
Open-mindedness					
Commitment					
Dedication					
Ability to manage risks					
Credibility					
Ingenuity					

15. Your personality traits are:

Flexibility	Yes	No	Don't know
Assertiveness			
Mobility and remote working			
Ability to solve problems			
Adaptability to new working conditions			
Ability to implement innovative ideas			
Acceptability of new responsibilities			
Ability to work in an age diverse team			
Ability to work in a multicultural environment			

Questions about ICT

16. Indicate areas where applied ICT supports/develops organizational agility (ability to respond to change and unpredictable situations) (multiple choice question)
Teamwork
Decision-making
Project management
EDI - electronic document flow
B2B or B2C
SCM - supply chain management
CRM - customer relationship management
Communication
Networking
Virtualization of business processes
E-commerce
E-business
Remote working
Other

17. Indicate which ICTs are most commonly used in your company? (multiple choice question)
Spreadsheets
Databases
Data visualization tools
Corporate portals
Social networking sites
Data warehouses
Business intelligence and Big data

Cloud computing
Internet of Things
Mobile technologies
Artificial intelligence
Other

18. rate the degree of influence of the above-mentioned ICT technologies on organizational agility: (scale of 1-5)
Innovation

19. In your enterprise:

	Yes	No	Don't know
A research and development (R&D) department is in operation			
Systematic training is provided			
Some changes are constantly introduced			
An external company is used in the IT area (IT outsourcing)			
Analysis of large amounts of data (big data) is performed			
Data analysis and visualization systems are used			
Customer suggestions via ICT are used			
New knowledge is constantly being acquired			

20. Has your company introduced innovations that have a significant impact on business process efficiency?
Yes
No
Don't know
(if yes go to 20, if no go to the end)

21. Was the innovation:
Product-based
Process
Marketing
Organizational

22. Was the innovation the result of: (max 3 answers)
The activity of your own R&D department
The work of the project team
Expectations and suggestions of customers
The initiative of employees or managers
Continuously implemented changes
Built relationships with business partners
Cooperation with an external company
International cooperation
Big data analysis
Analysis of social media activity
Implementation of sustainable development principles
Changes in strategy towards corporate social responsibility
Other

23. How did your company's employees react to the introduction of the innovation?
Full acceptance
Neutrality
Control of the situation
Lack of acceptance
Resistance to change
Willingness to escape
Other

Thank you for completing the survey.