European Research Studies Journal
Volume XXV, Issue 1, 2022

pp. 720-738

Implications of Industry 4.0 for Security in Contemporary Organizations – Perspective of Information Strategies

Submitted 16/12/21,[1st] revision 18/01/22,[2nd] revision 09/02/22, accepted 01/03/22

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Abstract:

Purpose: *The development of information and communication technologies (ICTs) contributes to many organizational and functional changes in modern organizations. The aim of this article is to indicate whether and how Industry 4.0 instruments can affect changes in the operation of the organization and its security.*
Design/methodology/approach: *The study has been conducted using the CAWI method on a random sample of 225 Polish organizations (involved in production, trade or services). Respondents were owners, board members, general managers, or IT managers. The study was conducted between July and September 2020 throughout 16 voivodships in Poland. The study is dominated by an inductive approach.*
Findings: *In the conducted research among Polish organizations, the significant importance of the Industry 4.0 environment was confirmed. ICTs can significantly strengthen the potential of a modern organization by selecting and using an appropriate information strategy with particular attention to the level of information security.*
Practical implications: *The article contains an assessment of how Polish organizations shape their security through resilience conditioned by the use of IT platforms and tools. In addition, recommendations are included, which affects the usefulness of information strategies in the context of organization security.*
Originality/Value: *The issues raised in the article are not exhaustively treated in international literature and require successive exploration. The research indicates the way and scope of using ICTs and their impact on the security of organizations in the context of information strategies. Security is not regarded in the study as a derivative of protection against cyber threats (which dominates in the contemporary literature), but as a result of constructive use of ICTs to ensure information, decision-making and business continuity of the organization, especially by creating its resilience.*

Keywords**:** *Security, organization, information strategy, Industry 4.0, ICTs.*

JEL classification: *D80, M15.*

Paper type: *A research study.*

Funding: *This work was financed by Military University of Technology under research projects No. UGB 744/2020 and UGB 864/2021.*

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1. Introduction

Contemporary organizations expose the power of interaction with the environment as a factor strengthening their potential. In the era of the fourth technological revolution, the value of information and the possibility of sharing resources and cooperation of dispersed entities are emphasized. Competitive advantage is no longer the dominant criterion. The aim is therefore to eliminate spatial and temporal constraints, which is important for the integration of so-called SMEs. Modern business structures are therefore "a temporary network of independent entities (suppliers, customers, even existing competitors), connected by information technologies to share skills, resources, costs and access to their own and new markets; it is a comprehensive system that brings together producers, suppliers and customers into a single, informative whole" (Byrne and Brandt, 1993, pp. 36-41). This means that modern organizations focus their activities on common, specific goals implemented in a flexible, agile process model, in which the effective use of the skills and competences of the constituent entities is sought.

Information strategies combined with the X-engineering strategy enable the creation of agile process organizations. However, the cooperation of many entities in cyberspace requires care for constant evaluation of the risk of loss of information continuity of operations and ensuring security, including information security (Woźniak and Zaskórski, 2021), as well as maintaining common (business) situational awareness (SA) of all stakeholders of the modern organization (Zaskórski, Zaskórski, and Woźniak, 2021).

Therefore, the main objective of this study is to indicate whether and in what way the Industry 4.0 environment and related ICTs can affect the usability and implementation of information strategies and the security of these entities.

The article consists of four main parts, which concern: (1) the essence and identification of selected attributes of the Industry 4.0 environment, (2) indication of basic classes of information strategies in the context of ensuring the security of the organization, (3) presentation of the results of empirical study, as well as (4) specification of conclusions in the field of implementation of information strategies in the context of shaping the security of the organization.

2. The Essence and Selected Attributes of the Industry 4.0 Environment

The Fourth Technological Revolution (Industry 4.0) is a continuation of the concept of "industrial revolution" through the extensive use of models, systems and tools for automation, data processing and exchange (Schwab, 2018; Gilchrist, 2016) not only in management processes, but also in manufacturing and service ventures. This concept emphasizes the importance of techniques and principles of creating the so-called value chain using cyberspace (i.e., Internet of Things, cloud computing, cyber-physical systems). Hence, the real models of the Smart Factory (cities, buildings, etc.)

are created, in which cyber-physical systems (robots /cobots) controlling physical processes are combined, monitoring the implementation of selected processes, and at the same time generating a lot of data. The Internet of Things (intelligent objects) in on-line mode enables ongoing data collection and exchange and power supply to collecting and processing systems with the ability to communicate efficiently with other objects (including people). Thanks to services in cyberspace, the results of activities for the environment (to various stakeholders) can be externalized without restrictions of place and time (Mell and Grance, 2011) and with inputs and effects adequate to the nature and scale of services (Intalar and Jeenanunta, 2019).

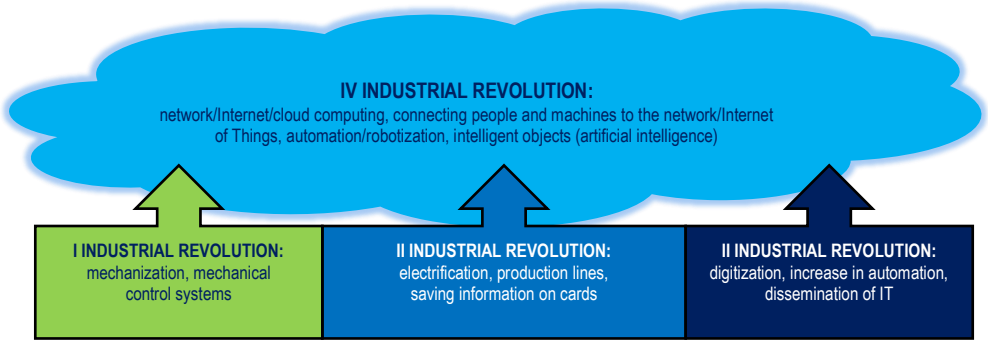
Industry 4.0 is the era characterised by the disappearance of the barrier between people and machines. Smart Factories with cyber-physical production systems directly combine human potential in social and business networks with the exposition of the criterion of mobility, elasticity and flexibility of operation (resilience). Therefore, activities related to connecting people, things, services and data depicting these activities in real time, in a multidimensional, fast-changing perspective, are integrated on the Internet platform.

The changeability of the environment is one of the main attributes of modernity and an inherent feature of modern organizations. Change often becomes an opportunity for development and the emergence of new opportunities, but it is also a source of threats to the activities of modern business entities. Changes that are characterized by violence and radicality are described as revolutions (Sikorska-Michalak *et al.*, 1996, p. 945), including industrial revolutions, strongly influencing the development of the world.

It can be assumed that the term Industry 4.0 means "the integration of systems and the networking and integration of people with digitally controlled machines, making extensive use of the Internet and information technologies and strategies. In broad terms – level 4.0 should be understood as a common term combining technology and the organization of the value chain" (Gajdzik and Grabowska, 2018, p. 223). It is worth noting that the concept of Industry 4.0 also sanctions the individual dimension of this environment for the full integration of the resources of each organization for more effective use of its own and available resources from its environment (Michna and Kaźmierczak, 2020, p. 31).

The essence of using this environment is to create intelligent value chains that are based on Smart Factories as social engineering systems, which are built using virtual networks connecting employees, machines and other devices under the supervision of professional ICT systems. Depending on the conditions and objectives, these networks may be the subject to dynamic reconfiguration. Thus, the virtualization of economic processes affects group intelligence and knowledge bases generated from internal and common data resources (Bendkowski, 2017, pp. 23-24) (Figure 1).

Figure 1. *Basic attributes of technical and technological evolution in the perspective of industrial revolutions*



Source: *Own elaboration based on Piątek, 2017.*

The priority requirements and objectives of Industry 4.0 include (Zoubek *et al.*, 2021; Lee *et al.*, 2015; Gökalp *et al.*, 2017):

- improvement of communication in the relationship: supplier-customer,
- creation and constant development of new business models,
- increasing the efficiency of using available own resources and sharing them with the environment (openness of operating systems),
- exposure of growing, individual consumer requirements and creation of intelligent (unambiguously identifiable) products,
- continuous monitoring and control of the full life cycle of products,
- creating and developing Smart Factories based on smart production devices,
- global networking of machines, as well as data storage and processing systems,
- taking into account the correlation of Industry 4.0 solutions with ecology and employee health through work-life balance.

Industry 4.0 is the era of turbulent and fast-changing environment, which is characterized by a number of changes not only technological, but also economic and social (Bembenek, 2017, p. 36) in the sphere of situational awareness. Digitization of organizations and knowledge management, as well as mass customization of offered products and services are of great importance (Adamik, 2018, p. 88). The key resources should include employees, their knowledge, the ability to build relationships using modern technologies, and information strategies.

3. Information Strategies and Ensuring the Security of the Organization

The modern spectrum of ICT tools and platforms makes it possible to create a variety of information strategies depending on the potential of a given entity. Information strategies indicate the role of reliable and efficient information with exposure to the value of information resources and how to use them effectively in the relationship: decision-making system – executive system. The information strategy becomes a component of the management system that takes into account the dynamics of the

environment and the way information is exchanged between different objects and stakeholders, which strengthens informational coherence and business continuity (Dawes and Helbig, 2010).

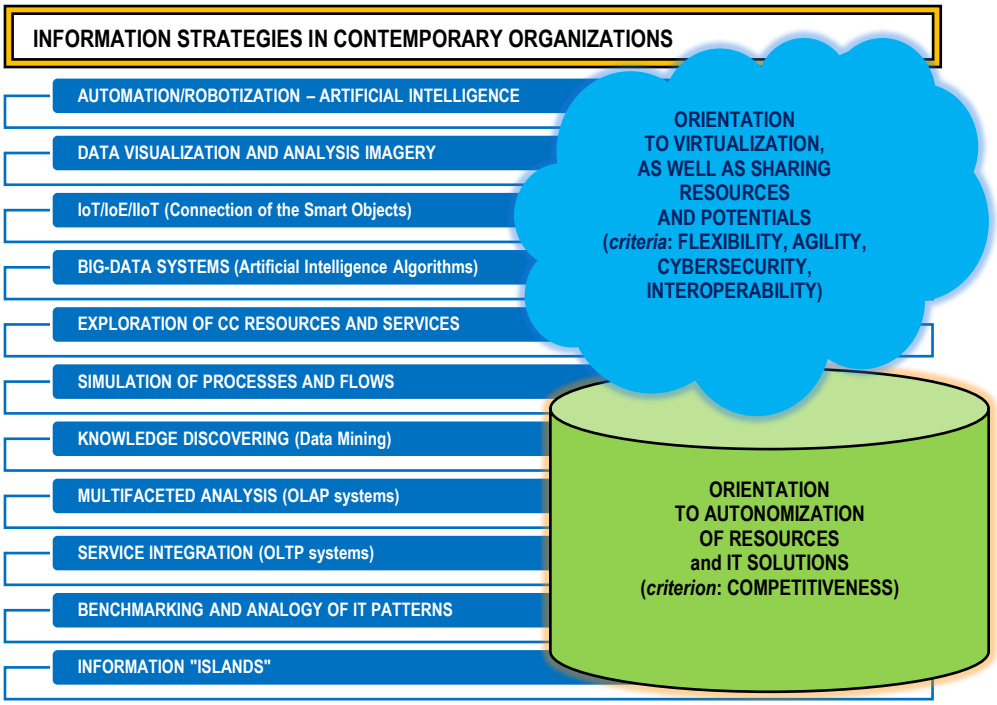
These attributes determine the level of business and organizational continuity conditioned also by information security resulting from the technical and technological capabilities of protecting information resources sensitive to a given entity (Diesch *et al.*, 2020; Szczepaniuk *et al.*, 2020; von Solms and van Niekerk, 2013). In the era of Industry 4.0, one can discuss several information strategies based on currently available, complementary ICT tools and platforms. The development of strategies can be seen from autonomous domain solutions to the use of advanced ICT techniques and technologies. Thus, information strategies are as follows (Figure 2):

1. Information "islands" based on classic/company tools.
2. Analogy and benchmarking related to the use and adaptation of duplicative solutions, especially in the area of planning and control of basic processes.
3. Integration of information services using data integration models and processes of exchange of management documents and graphic imaging systems (Zaskórski *et al.*, 2021).
4. Multifaceted analysis using OLAP data and analytical software for long-term evaluation of the effectiveness and efficiency of the organization (Zaskórski *et al.*, 2020).
5. Data-Mining for knowledge discovery and knowledge bases taking into account the needs of forecasting and strategic planning.
6. Simulation of business processes and material flows between different entities with a division of the roles of suppliers, implementers, recipients, etc.
7. Exploration of information resources in cyberspace (use of CC services: Mateos and Rosenberg, 2011, pp. 70-72) as a strategy to reduce the information exclusion of smaller business entities (SMEs).
8. Exploration of multiform information resources of very high volume (Mayer-Schonenberger and Cukier, 2014), located in cyberspace using e.g., artificial intelligence algorithms.
9. Monitoring and connecting of things and people, as well as collecting a very large amount of data on the state and implementation of business processes using IoT platforms (Miller, 2016), as well as IoE and IIoT (Gilchirtst, 2016).
10. Use of advanced models and data visualization systems using geospatial analysis.
11. Robotization, cobotization and automation of manufacturing and service processes using artificial intelligence.

Each of the strategies is determined by the level of IT development. Currently, standard tools for creating information "islands" (text and graphic editors, spreadsheets, relational database systems, etc.) can still be used, but this data can be imported into data warehouses or into Big-Data systems for collection and

multidimensional data analysis (Mayer-Schonenberger and Cukier, 2014). This offers the possibility of flexible and effective operation of corporate organizations with a large number of process connections. The accumulated data resources can also be a good reinforcement of simulation models, verifying the entire model of operating of modern organizations.

Figure 2. *Selected information strategies supporting the management of modern organizations*



Source: *Own elaboration.*

The era of globalization combined with the idea of the information society and Industry 4.0 leads to the networking and virtualization of modern organizations. Business continuity and effectiveness of information processes affect the mobility and flexibility of business entities. The IoT/IoE strategy becomes particularly important as a platform for connecting objects, machines and people into a coherent organization and creating network structures (Miller, 2011). Information and decision-making efficiency, due to ongoing monitoring of the state of implementation of processes and the use of dispersed resources related to them, creates an appropriate level of security and business continuity with interactive verification of the effectiveness of business activities, supported by an appropriate level of situational awareness (Zaskórski, 2020).

Ensuring business continuity should be considered as a good criterion for the quality of the management system of the entire organization. This means that care should be taken to choose the right information strategy and minimize the risk of losing information continuity (Woźniak and Zaskórski, 2021). Prioritising and scoring the objectives, tasks and operating costs can help to meet flexibility and performance on the ongoing activities.

In addition, the rationalization of the selected information strategy is a determinant of care for the credibility, efficiency and effectiveness of achieving goals and satisfying the needs of the consumer/recipient in a specific place and time (Zaskórski, 2020). Modernity sets important directions for changing and improving these strategies in the context of agile, flexible, innovative and proactive development strategies, which distinguishes Industry 4.0 from previous revolutions.

The concept of Industry 4.0 reflects the ideas of new solutions often combined with already used information strategies and the conditions for their implementation, taking into account the broadly understood digitization adapted to the ICT infrastructure and electronic environment on a global scale. Digitization of processes and resources serves to improve efficiency through new forms of work with the customer (dynamic identification of needs) (Sun *et al.*, 2020), new models of operational processes and the functioning of the entire organization (Birch-Jensen *et al.*, 2020; Pieriegud *et al.*, 2016, pp. 12-13). Digital transformation places demands on digital data, connectivity, automation and digital customer access.

These activities lead to the creation of digital enterprises, also called agile or virtual, based on innovative forms of business relations using available digital resources (Gajdzik and Grabowska, 2018, p. 227). These resources may be a consequence of selected information strategies' implementation.

Virtualization of modern organizations is conditioned by an access to current information about processes and potential contractors without restrictions on time and place of operation on a global scale. Hence, CC services become a reinforcement of traditional IT services in a distributed organization (Mell and Grance, 2011, pp. 1-3), which affects the level of security. Each user in the virtual system can receive from the CC service provider a set of professional tools that prevent process by inconsistencies and increase processing security. In addition, tasks related to the handling of strategic activities, processes, projects, the implementation of which is adapted to the financial capabilities of a given organization, are transferred to the cloud.

At the same time, selective access to own information resources or resources shared with other entities becomes important, which may condition the common situational awareness (Zaskórski, 2020) and the security of the entire organization, implied by the information security (da Veiga *et al.*, 2020, pp. 2-20). The flexible redefinition of the capabilities and needs of the dynamically created entity determines the continuity

of the entire organization. However, it is important to remember about the environment and the large role of Big-Data systems that reflect relations with customers (i.e. customer obsession). Models and techniques of advanced Data Mining combined with their visualization (Stępniak, 2016, pp. 201-215) offer an extended perspective of forecasting organizations' rational functioning and development.

4. Results of the Empirical Study – Information Strategies of the Organization and the Assurance of the Security within Industry 4.0

The implementation and application of the information strategies specified above encounters various organizational and competence barriers, but also highlights opportunities and needs in this area, which has been confirmed by the research on the business environment in Poland.

4.1 Methodology of the Empirical Research and Specification of the Test Sample

The study concerns the issue of the use of currently developed information technologies in improving business and managerial processes by shaping and implementing selected information strategies that may affect the security of modern organizations.

Table 1. *Attributes of organizations qualified to the test sample (N=225)*

Organization attributes	**Number of occurrences**	**Incidence (%)**
Business profile:		
Production	75	33%
Trade	75	33%
Services	75	33%
Form of the ownership:		
Partnership	79	35%
Capital company	124	55%
Sole proprietorship	22	10%
Ownership capital:		
Advantage or exclusivity of the Polish capital	173	77%
Advantage or exclusivity of the foreign capital	52	23%
Size (by the number of employees):		
10-49 employees (small)	75	33%
50-249 employees (medium-sized)	75	33%
250 and more of employees (big)	75	33%
Level of the organization's computerization:		
None or low	8	4%
Medium	99	44%
High	96	43%
Very high or total	22	10%
Position of the respondent:		
General manager	104	46%
IT manager	41	18%

Member of the management board	44	20%
Owner	36	16%
TOTAL:	**225**	**100%**

Source: *Own elaboration.*

The main objective of the study is to indicate how the use of ICTs (as an Industry 4.0 instrumentary) may affect the configuration of information strategies and the security of the entities studied. The research problem is as follows: *How do organizations use Industry 4.0 instruments to shape their security?* In order to clarify the research problem, three research questions have been developed:

RQ 1: What are the conditions for the development of Industry 4.0 assumptions in the surveyed organizations?
RQ 2: Which solutions of Industry 4.0 are important in shaping information strategies in the surveyed organizations?
RQ 3: What are the basic areas and processes of improving information strategies determining the security of the organization?

The survey was conducted on a random sample of 225 Polish organizations (involved in production, trade or services). Respondents were owners, board members, general managers, or IT managers. Table 1 shows the specification of the test sample. The study was conducted between July and September 2020 throughout 16 voivodships in Poland. In the empirical study, quantitative methods of analysis and selected research techniques were used.

First of all, an inductive approach was used, which made it possible, on the basis of the analysis of individual observations, to generalize phenomena and dependencies (Sułkowski, 2012, p. 95; Dobrzycka, 2014, p. 281; Wojciechowska, 2016, p. 116). It is worth noting here that the study also took into account elements of the deductive approach, mainly at the stage of critical analysis of domestic and foreign literature sources – when constructing the CAWI questionnaire. The study also used analysis and synthesis – as a specific consequence of the combination of deductive (literature exploration and theoretical inference) and inductive (analysis of single observations) approaches (Hajduk, 2012, p. 119). The inductive approach used the CAWI technique and statistical analysis of quantitative data (Sudoł, 2012, pp. 136-145; Apanowicz, 2005, p. 57).

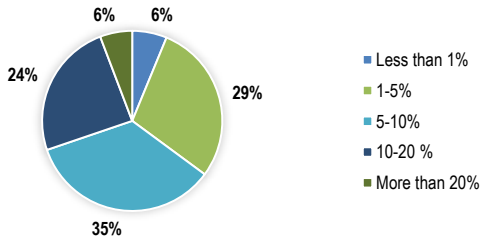
4.2 Circumstances of the Development of Industry 4.0 Assumptions

In order to indicate how the use of ICTs in Industry 4.0 conditions can affect the formation and selection of information strategies, as well as the security of these entities, one should first consider the approach of the surveyed organizations to financing their computerization. The results of the survey indicate that 64% of respondents declare donating from 1 to 10% of the overall budget of the organization for the development of IT services and support for computerization processes of activities. It is also worth paying attention to the fact that financing at the level of 10-

20% occurs in up to 24% of the surveyed entities. It is also encouraging that the financing of the IT area in organizations at a level exceeding 20% of the general budget was declared by 6% of respondents (Figure 3). On the basis of the above results, it can be assumed that the surveyed entities have good financial conditions to improve information strategies and thus shape their security through the implementation of Industry 4.0 tools. In addition to financing the computerization, an important condition for the development of Industry 4.0 assumptions in organizations are the digital competences of employees.

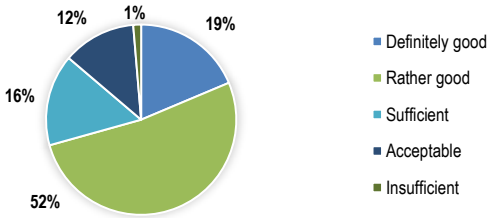
The surveyed entities are clearly dominated by the definitely good and rather good level of this class of competences amongst employees – in the opinion of managers and owners of the organization (a total of 71% of indications). On the other hand, a sufficient and acceptable level of development of these competences is declared by a total of 28% of respondents (Figure 4). Therefore, also in this aspect, the surveyed entities have good conditions to implement the Industry 4.0 environment and increase the level of their security.

Figure 3. *Percentage of the organization's overall budget spent on computerization (IT services) (N=225)*



Source: *Own elaboration.*

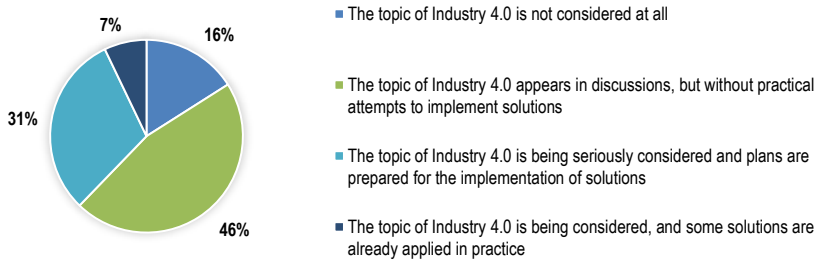
Figure 4. *The level of digital competences of the organization's employees (N=225)*



Source: *Own elaboration.*

Almost half of the surveyed organizations (46%) declare that the topic of Industry 4.0 appears in discussions, but without practical attempts to implement solutions, and in 16% of entities the topic of Industry 4.0 is not considered at all (Figure 5). Such a situation may indicate that despite the fact that financial and competence conditions are good in the surveyed organizations, for specific reasons, solutions/tools dedicated to Industry 4.0 are not implemented in business, information and decision-making processes – which may weaken the potential of the organization.

Figure 5. *The level of implementation of the Industry 4.0 assumptions in the organization (N=225)*



Source: *Own elaboration.*

However, it is optimistic that in 31% of organizations the topic of Industry 4.0 is being seriously considered and plans are prepared for the implementation of solutions, with 7% of respondents indicating that the topic of Industry 4.0 is being considered, and some solutions are already applied in practice (Figure 5). Therefore, it is clear that in the area of implementation in the surveyed entities it is necessary to activate the environment for the implementation of ICT tools (as instruments of Industry 4.0).

4.3 The Importance of Industry 4.0 Links in Shaping Information Strategies

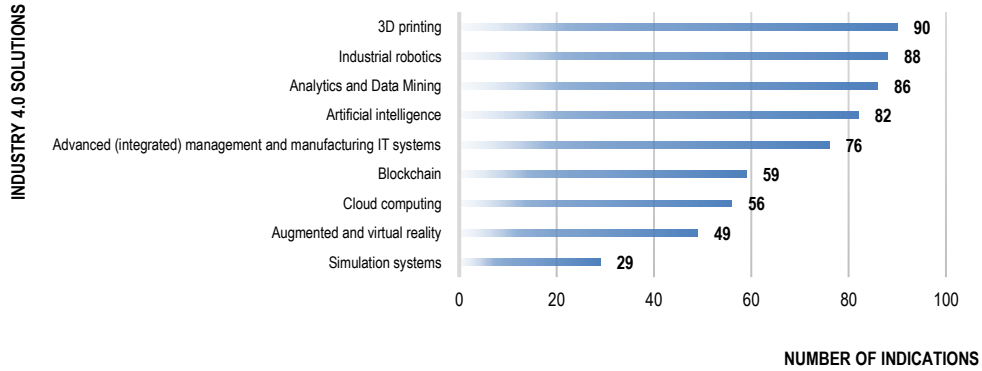
Another issue related to shaping the security of modern organizations is to indicate which Industry 4.0 solutions are in the opinion of respondents particularly important for the organization. The largest number of indications are, 3D printing (90 indications), industrial robotics (88 indications), analytics and Data Mining (86 indications), artificial intelligence (82 indications), as well as advanced (integrated) management and manufacturing IT systems (76 indications) (Figure 6).

Therefore, it can be seen that in the opinion of respondents, the most appreciated tools are those supporting data analysis and creating useful knowledge, as well as solutions directly supporting the management of operational manufacturing processes. The least important in the opinion of respondents in the field of constructive shaping of information strategies are: simulation systems (29 indications), augmented and virtual reality (49 indications), as well as cloud computing (56 indications) and blockchain (59 indications) (Figure 6). This may be due to the fact that these solutions are too technologically advanced for other organizations and may require additional (not necessarily intuitive) digital competences.

At this point, it is worth adding that the surveyed organizations in a developed or limited form use (but apply!) first of all: internal communication platforms (58% of indications), ERP systems and cloud computing services (both 50% of indications), as well as Internet of Things solutions (40% of indications). The largest percentage of respondents plan to implement, data warehouse systems and OLAP/Data Mining

(DM) class tools (29% of indications), Internet of Things solutions (28% of indications), as well as ERP class systems (27% of indications).

Figure 6. *The Industry 4.0 solutions particularly relevant for organizations – a multiple choice question (N=225)*

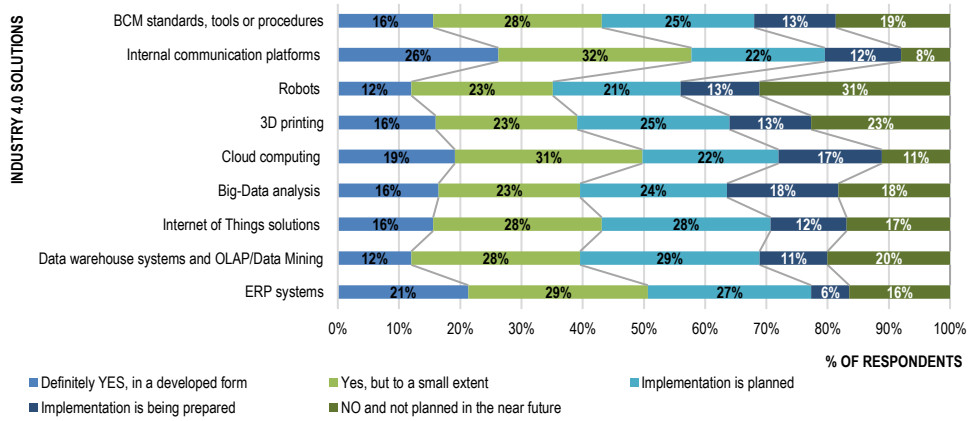


Source: *Own elaboration.*

In the largest percentage of organizations, the implementation of Big-Data analysis (18% of indications) and cloud computing services (17% of indications) is being prepared. On the other hand, robots (31% of indications) and 3D printing (23% of indications) are not used and are not planned to be implemented in organizations (Figure 7).

Using specific Industry 4.0 tools or planning their implementation to improve information strategies and thus ensure the security and resilience of modern organizations is one thing. Another, equally important, aspect of activities in this area is the identification of key boundaries for implementing Industry 4.0 solutions.

Figure 7. *Scope of application of selected IT solutions in the organization (N=225)*

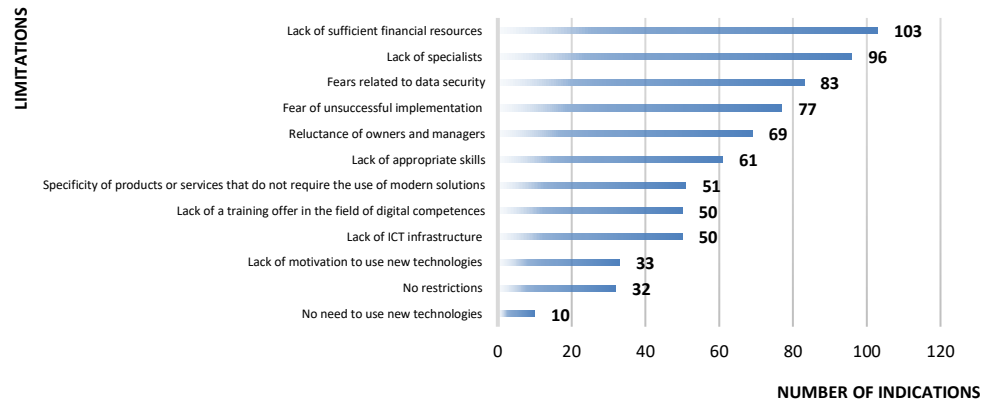


Source: *Own elaboration.*

The results of the empirical study indicate that in the opinion of respondents, the greatest barriers to the implementation of Industry 4.0 solutions are: lack of sufficient financial resources (103 indications), lack of specialists (96 indications), fears related to data security (83 indications), as well as fear of unsuccessful implementation (77 indications), reluctance of owners and managers (69 indications), and lack of appropriate skills (61 indications). Less important limitations in the opinion of respondents are: specificity of products or services that do not require the use of modern solutions (51 indications), lack of a training offered in the field of digital competences, and lack of ICT infrastructure (50 indications), as well as lack of motivation to use new technologies (33 indications).

It is also worth noting that 32 respondents indicate that in their organizations there are no restrictions on the implementation of Industry 4.0 solutions. On the other hand, 10 respondents stress that there is no need to use new technologies (than those already implemented earlier) in terms of improving information strategies – therefore there are no restrictions in their organizations (Figure 8).

Figure 8*. Limitations for the implementation of the Industry 4.0 solutions – a multiple choice question (N=225)*



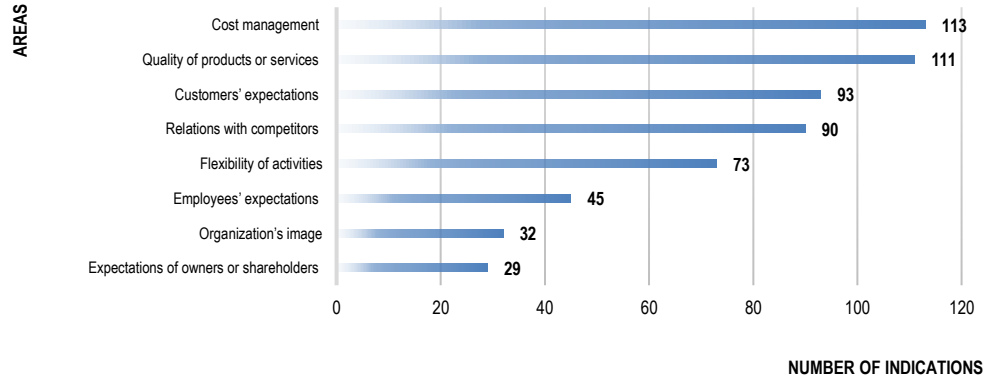
Source: *Own elaboration.*

4.4 Areas and Processes of Improving Information Strategies and Organization Security

The basic areas related to the implementation of Industry 4.0 solutions in improving information strategies in the opinion of respondents are, cost management (113 indications), quality of products or services (111 indications), customers' expectations (93 indications), relations with competitors (90 indications), as well as flexibility of activities (73 indications). In turn, the "secondary" areas related to the implementation of Industry 4.0 solutions are, employees' expectations (45 indications), organization's image (32 indications), and the expectations of owners or shareholders (29 indications) (Figure 9).

It seems that such a picture has its justification, because areas of implementation of Industry 4.0 solutions the most frequently indicated are particularly important from the point of view of shaping information strategies aimed at creating the market potential of the organization by strengthening its resistance and the possibility of cooperation with the environment.

Figure 9. *The areas of implementation of the Industry 4.0 solutions in the improvement of the organization and its information strategies – a multiple choice question (N=225)*



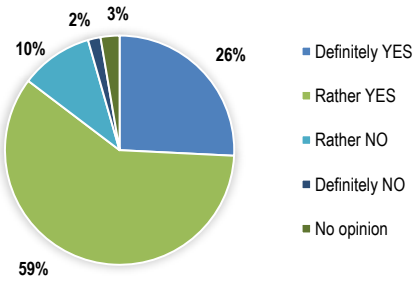
Source: *Own elaboration.*

Identifying the key areas of implementation of Industry 4.0 solutions in the improvement of information strategies is important, but above all more significant is to what extent and in which areas the information strategies resulting from the Industry 4.0 concept can be conducive to the improvement of the organization (Fig. 10) in the long term, e.g., the next five years.

According to the results of the empirical study, 26% of respondents indicate that it is definitely possible, and 59% of respondents think that it is rather possible. Only 12% of respondents answere that this is unlikely to be possible or it is not possible at all (Figure 10). Therefore, the implementation of Industry 4.0 solutions can be beneficial for the organization not only in the short term, but also in the long term. Investments in the ICT area can therefore be regarded as a type of investment in improving the organization and strengthening its potential, and thus ensuring business security and business continuity for digitized organizations.

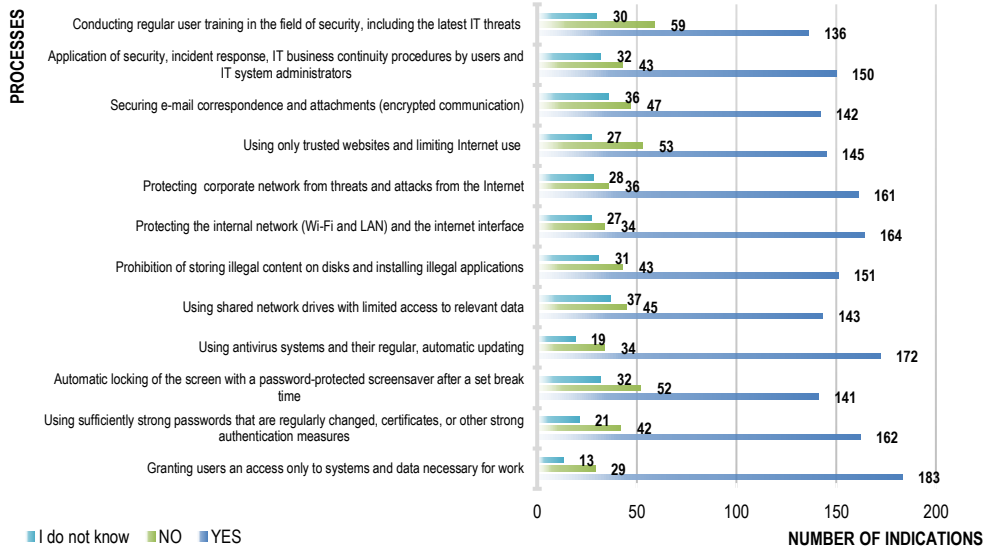
The beneficial effects of the implementation of Industry 4.0 tools in the development of information strategies are important, but at this point it is necessary to focus on how the development of information strategies itself can determine the security of the organization. The set of processes improving information strategies within Industry 4.0 and thus affecting the security of the organization is quite numerous. The most important of these are exposed on Figure 11.

Figure 10. *Indication of whether the concept of Industry 4.0 can be the basis for shaping the organization's information strategies over the next five years (N=225)*



Source: *Own elaboration.*

Figure 11. *Processes improving information strategies in the Industry 4.0 conditions affecting the security of organizations (N=225)*



Source: *Own elaboration.*

When analyzing Figure 11, it is worth noting that all the listed processes directly or indirectly can affect the level of security of the organization. It is also worth to indicate that in principle, each of the 12 detailed processes in the opinion of respondents can affect the security of the organization. Noteworthy there are processes related to confidentiality and limiting access to shared information resources in network (virtualized organizations), including: granting users an access only to systems and data necessary for work (183 indications for "yes"), as well as the use of antivirus systems and their regular, automatic update (172 indications for "yes").

Nevertheless, according to a relatively large number of respondents, processes such as, conducting regular user training in the field of security, including the latest IT threats (59 indications for "no"), using only trusted websites and limiting Internet use (53 indications for "no"), as wel as automatic locking of the screen with a password-protected screensaver after a set break time (52 indications for "no"), do not have a positive impact on the level of security of the organization. Therefore, this requires a longer process of creating situational awareness determined by the properties of the Industry 4.0 environment.

5. Assessment and Implementation of Information Strategies in the Context of Shaping the Security of the Organization

Polish organizations, as presented by empirical research on a sample of 225 entities, approach constructively to shaping their security and the value of their own organization through the selection of IT tools that determine information strategies. In given organizations a financial and competence potential exists with a fairly high awareness of managers and owners about the need to implement Industry 4.0 tools and use them in improving the level of security within the use of appropriate information strategies.

However, the problem may be the effective "use" of this potential. A significant part of organizations declares their willingness to implement the assumptions of Industry 4.0 in their information strategies and is just planning to implement specific ICT tools. However, it is worth emphasizing the fact that the surveyed organizations are aware of this and include such processes in the planning system, both in a short and long term. This is a good forecast for the next 10-15 years of development of the digital economy. In addition, it should also be noted that these organizations are generally aware of the criteria for selecting ICT technologies (solutions) that will be most beneficial for them in improving information strategies and in their selective – but systematic – implementation.

There is no phenomenon of widespread implementation of technological "novelties". Organizations are guided by the usability of solutions, which can further strengthen the effect of creating their security. What is more, organizations are aware of the occurrence of specific implementation threats for Industry 4.0 tools, which makes them adequate in the area of IT potential development, and at the same time reduce operational risk.

At this point, however, it should be emphasized that the construction of information strategies useful in shaping the security of the organization should be based on various groups of resources – not only on ICT technologies and finance. Especially important here are the competences (e.g., digital) of employees – without them, even the best planned information strategy will not be able to be implemented successfully. It is also necessary to think and act holistically. The design or development of information strategies aimed at ensuring security should refer to the key areas of the organization's

operations, as well as should take into account the most effective technologies and risks associated with them in given circumstances.

Information strategists resulting from the Industry 4.0 environment are characterized by a high technological complexity, certainly increase the level of resilience of modern organizations and can affect the security of the organization in various dimensions. These dimensions should strengthen the level of business security of the entire organization through information and process integration coupled with the risk management system in the organization. It should not also be overlooked that managers and owners should recognize the role and importance of the development of information strategies also in technical and technological dimensions, affecting the security of the organization.

6. Conclusions

The Industry 4.0 environment, as a continuation of previous industrial revolutions, particularly highlights the role of cyberspace and artificial intelligence models. This is related to the high value of information resources and encourages radical changes towards making the models of functioning of modern organizations more flexible.

Thus, the specific value of data, information and knowledge generated from various information resources located in cyberspace is associated with ensuring the security of the entire organization through the use of professional mechanisms to protect these resources. The information strategies indicated in the article are a framework set of possibilities from which every organization can compose an individual hybrid strategy depending on its needs. And so it happens in reality.

The creative use of innovative technologies states a new reality. Industry 4.0 is an environment that even forces the digitization of the organization, as well as the improvement of relations with customer and the improvement of business processes.

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