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ORIGINAL PAPER

CORPORATE MATURITY DESIDERATA IN THE FACE OF THE COVID-19 PANDEMIC – THE DIGITAL PLANE OF LOGISTICS MICROFOUNDATIONS

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ABSTRACT. **Background:** In the light of the economic slowdown and significant strategic uncertainty resulting from the currently prevailing SARS-Cov-2 epidemic crisis, it is reasonable to undertake research to identify key competences that are relevant to the continuity of the supply chain functioning. The logistics processes in their current shape will undergo a significant change. Therefore, based on a widespread discussion that has been recently taking place in the environment of scientists, politicians, local government officials and management practitioners, the question once again arises about the level of preparation of enterprises for functioning in this specific environment. Aiming to fill the existing gap in knowledge, a series of studies was conducted, the main purpose of which was to recognize key competences from the point of view of existence in the conditions triggered by the COVID-19 crisis. Considering the empirical evidence confirming the existence of a strong relationship between company stability and an effective supply chain, the following research direction aggregates logistic microfoundations to the attribute of a "mature" enterprise.

Methods: Referring to the outlined objective, using the method of reconstruction and interpretation of the literature on the subject, it was recommended to nominate questions assessing the level of maturity of logistics subsystems (theoretical layer) as a necessary action. At the conceptual (design) level, it was crucial to compile the research tool being the resultant of the related literature exploration (theoretical model) and discussion among deliberately selected experts ("virtual" brainstorming). At the empirical level, this enabled the recognition of competences that determine the survival of enterprises in crisis conditions, and thus allowed the development of recommendations for managers of manufacturing enterprises.

Results: The paper proposes a procedure and a tool to identify key capabilities that determine the survival of enterprises in COVID-19 crisis conditions. The brainstorming research model reflects the areas of digital technology that the manufacturers, in the context of the current pandemic, should absorb (coincidence). Moreover, it was established that the process of economic recovery will take place in cooperation with enterprises absorbing the logistic management model based on digital technologies. To sum up, it should be noted that the maturity of such an enterprise is manifested in the use of descriptions defined in the research, not only in terms of production, but also in the entire supply chain. All these activities need to be harmonized, creating a crisis-proof enterprise. The organization of such an enterprise is characterized by delegating as many tasks as possible to competent employees who, using the knowledge and available digital technologies, add value throughout the entire chain.

Conclusions: The results of the research confirmed the author's belief that on the one hand digital technologies imply the possibility of surviving in the face of the crisis caused by COVID-19 (continuity of the supply chain, remote work without participation, or with limited human participation, etc.), on the other, implemented by enterprises, can be a kind of "protective shield" against the negative effects of a pandemic; from the perspective of the issue taken in the research work, they determine the maturity of the company's logistics subsystems. It seems that relatively small scientific recognition and complexity of problems occurring in business practice justify treating the COVID-19 issue as the subject of research, which is reflected in this publication.

Key words: COVID-19, maturity, logistics subsystems, agricultural machinery sector.

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INTRODUCTION

Facing the constant uncertainty and crisis situations, the concept of "maturity" is becoming increasingly popular in logistics management [Rohloff 2009; Cronemyr and Danielsson 2013; Wendler 2012]. It develops gradually as a result of a process during which progressive digitization significantly determines the implementation of daily tasks. It is the result of the accumulation of many factors, among which logistic subsystems responsible for the effective implementation of the flow of products from the supplier to the customer can be listed. Therefore, especially in the face of the economic slowdown and significant strategic uncertainty resulting from the SARS-Cov-2 epidemic crisis, it is reasonable to undertake research to identify key competences that are important from the point of view of supply chain continuity, and thus implying the possibility of survival in the pandemic conditions. An indispensable action is therefore the recognition of abilities [Fawcett et al. 2011; Hammervoll, Leif-Magnus and Beske 2012; Wilden and Gudergan 2015] and competences [Antti and Greenhalgh 2012; Quintana, Ruiz, and Vila 2014], which on the one hand will allow companies to limit the negative impact of the pandemic, but on the other hand may be the basis for assessing their logistics subsystems.

To sum up, one can indicate the question: is there, at all, a need to measure maturity from the perspective of logistic microfoundations? Is such an assessment justified from the point of view of business practice? Assuming that the higher the level of maturity of individual microfoundations reflects the company, the greater the chance of survival (especially in the face of a crisis), and maybe even a chance of development (orientation on opportunities); the answer is affirmative. The research on the maturity of logistics microfoundations is quite difficult, nevertheless the paper attempts to recognize it, which may imply the development of recommendations for managers of manufacturing enterprises.

In relation to the above, the main purpose of the work was to recognize key competences from the point of view of existence in the conditions of the crisis caused by COVID-19. Referring to the outlined objective, using the method of reconstruction and interpretation of the literature on the subject, it was recommended to nominate questions assessing the level of maturity of logistics subsystems (theoretical layer) as a necessary action. At the conceptual (design) level, it was crucial to compile the research tool being the resultant of the related literature exploration (theoretical model) and discussion among deliberately selected experts ("virtual" brainstorming). On an empirical level, this enabled: (1) recognizing competences that determine the survival of enterprises in the conditions of the crisis, (2) identifying the catalogue of activities that should absorb enterprises, (3) developing recommendations for managers of manufacturing enterprises.

The gathered research material enabled to draw conclusions of a general and cognitive nature. The paper proposes a procedure and a tool that allowed to identify key capabilities and competences, which determine the survival of enterprises in crisis conditions. The solutions desirable from the experts' point of view were identified, on the one hand implying the minimization of the negative impact of the pandemic, and on the other, underpinning the assessment of their maturity, which, according to the author, will contribute to filling the knowledge gap in the presented scope. The material collected in the research procedure made it possible to verify the adopted presumptions; the above confirmed in the entire conducted theoretical and empirical argument. Hence, in the face of the COVID-19 pandemic, manufacturers should exhibit a relatively high level of technological organization (digitization), especially within procurement logistics and customer service logistics (P1). What is more, the brainstorming research model reflects the areas of digital technology that the manufacturers, in the context of the current pandemic, ought to absorb (P2). It was established that the process of economic recovery will take place in cooperation with enterprises absorbing the logistic management model based on digital technologies (P3).

The results of the research confirmed the author's belief that on the one hand digital technologies imply the possibility of surviving in the face of the crisis caused by COVID-19 (do not disrupt the supply chain, remote work without participation, or with limited human participation, etc.), on the other, implemented highly by the studied enterprises, are a kind of "protective shield" against the negative effects of a pandemic, and from the perspective of the issue taken in the research work, they determine the maturity of the company's logistics subsystems.

The presented pieces of research do not exhaust the raised problems; however it is important that they at least should be a guide for those who want to survive in the face of the upcoming recession and limitations in the supply chain. It seems that relatively small scientific recognition and complexity of problems occurring in business practice justify treating the COVID-19 issue as the subject of research, which is reflected in this publication.

MATURITY OF LOGISTICS MICROFOUNDATIONS – A STARTING POINT

According to the author of the paper, the problems with assessing maturity occur mainly due to the fact that in management and quality sciences there are a multitude of different fields, trends, approaches, schools of thought, and approaches incompatible with each other. Therefore, the first step in determining the theory of maturity should be the adoption of a new theoretical framework where one could logically group together the statements that make up the theory of maturity management. Difficulties in measuring maturity also arise from the fact that individual researchers creating lists of assessment criteria usually come from literature descriptions; there is no reference to practical needs in this area. The author ascertains that the diagnosis of such criteria is too general, artificial and hardly legible, not to say detached from reality. It should be borne in mind that environmental conditions change over time, and therefore the features of maturity should be modified situatively, in line with current market requirements, which can also be observed in reference to the SARS-Cov-2 pandemic.

When assessing the maturity of logistics subsystems, a number of methodological problems must be solved. How to design a maturity assessment system by referring it to individual logistic subsystems? How to construct maturity assessment indicators? How and with what frequency to measure it? How to analyse the obtained results? These are the most common questions that researchers and entrepreneurs seek answers to. From this point of view, the attempts made in the study to capture significant desiderata appear justified.

One of the most important problems associated with determining an unvalued maturity assessment is establishing the power of the created set of features. The set of features may contain quantitative features, whose states can be expressed in the form of numbers. In this case, particular criteria are given weight. It is necessary to obtain information from the decision-maker regarding the validity of the criteria, as the information may be subjective. Also, linguistic features might occur. Their states can be expressed in words, terms, sentences, which are most often gradable. The linguistic method of determining quality is based on the semiotic assumptions of the adopted language of description and first of all concerns the formulation of the content of each feature taken into account.

Achieving growing maturity through the improvement of logistics subsystems should be treated as a cyclical activity, which is focused on the constant search for more and more effective and more efficient abilities, competences or solutions adequate to emerging problems. In this sense, maturity means a state of readiness to implement certain activities. It is about the ability of an organisation and processes implemented by it to systematically provide better and better activity outcomes. This determines the degree to which all resources and competences of the organization are optimally allocated in stable processes that enable the organization to function. An enterprise is mature if its logistic subsystems can be considered mature from a qualitative point of view. Maturity is gradually developed as a result of improvement, during which the

desired abilities and competences are shaped to perform specific tasks.

The maturity of logistics microfoundations is relatively difficult to define. There is a multitude of definitions, there is no homogeneity, and sometimes different phenomena are defined using the same concept. Consequently, this leads to many misunderstandings in the interpretation of the concept. Management theory and practice shows that there is still a long way to accept one commonly accepted definition. Therefore, it is recommended to use definitions that are meaningful in the context of organizational conditions and can be used consistently in conducted research.

A mature logistics system implies supply chain continuity, especially in a dynamic, turbulent, unstable and uncertain environment. It is adequate to the conditions in which contemporary enterprises have to function. An expression of the system's maturity may be an immediate response to the need for changes in internal management systems, including shortening life cycles of not only technologies but also products, transition of many functions to the area of e-business, or implementation of innovations in individual subsystems. A mature logistics system is flexible, allows for introducing improvements and changes, and ensures business continuity. Therefore, it allows efficiently manage the organization so as to focus on actions and activities that bring the greatest added value and eliminate those activities and activities that at a given moment generate only high costs without bringing measurable benefits to the company.

The maturity of logistics systems today is one of the areas of logistics management discussed in theory as well as used in practice. This is one of many coherent and holistic management methods that are currently used. The author hopes that this idea is not a short-lived fashion, but a new approach to doing business.

Summing up, there is undoubtedly a confusion that sometimes leads to contradictory opinions, and even disputes about what the maturity of logistics systems really is, and thus what desiderata should describe it. This knowledge gap was the germ of this publication.

MATERIAL AND RESEARCH METHODOLOGY

Questions and presumptions

In-depth studies in the area of the problem studied above, own observations of economic practice and conducted empirical research conducted so far led to the formulation of specific questions, the solution of which was the answer to the main problem:

- What direction of strategic orientation should Polish manufacturers designate?
- What level of technological organization (digitization) in the area of logistics subsystems should reflect manufacturers operating in the Polish agricultural machinery sector?
- Which of these digital solutions should be absorbed by manufacturers in the face of the pandemic?
- What tools supporting logistics management, in the context of COVID-19, are crucial from the point of view of not disrupting the supply chain?

The formulated questions and belief on the existence of economic demand for results of application nature on the one hand were the main inspiration to undertake the research, while on the other, they became the starting point for formulating the below presumptions:

P1: In the face of the COVID-19 pandemic, manufacturers should exhibit a relatively high level of technological organization (digitization), especially within procurement logistics and customer service logistics.

P2: The flexibility of the production process, also in the face of the COVID-19 pandemic, determines the application of solutions that are proper for the Lean Management concept.

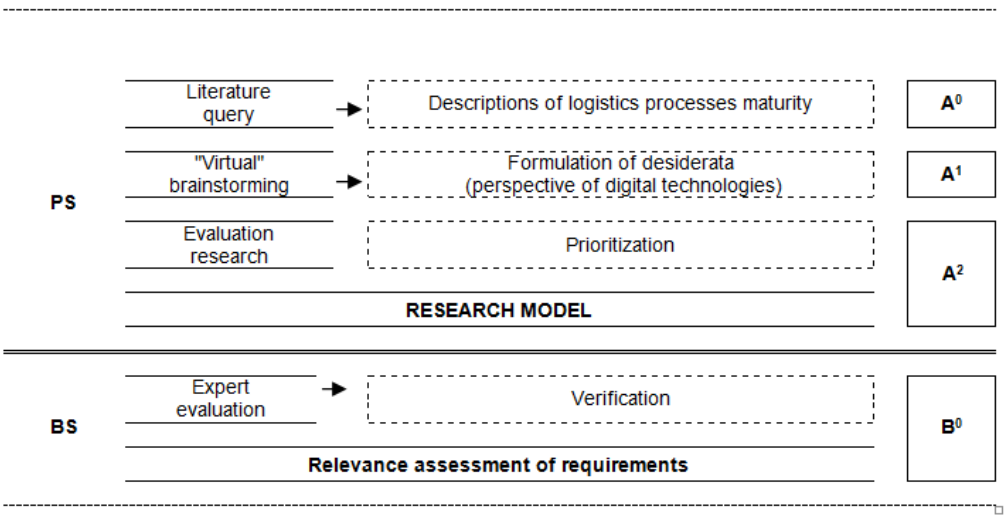
P3: The research model resulting from the expert discussion reflects the desired

directions of activities that in the face of COVID-19 should be absorbed by the surveyed enterprises. (research coincidence).

P4: The business model, in which digital technologies are the reference point, should imply the possibility of remote work, flexibility of working time organization forms as well as automation of supply, distribution and sales processes.

Research implementation scheme

In order to obtain objective information on the maturity of logistics subsystems, on the one hand, considered from the perspective of capabilities and competences, and on the other, implying the degree of probability of survival of enterprises in the face of COVID-19, a series of identifying studies, including the preparatory study [PS], was designed, including interpretation of the literature [A0], "virtual" expert discussion (brainstorming) [A1], expert study (evaluation team) [A2] and basic study (verification) [BS] including interviews in micro, small, medium and large manufacturing companies [B0]. The above is shown in Figure 1.



Source: own study

Fig. 1. Research implementation scheme

Formulation of the research model [PS]

Achieving the purpose of the work required – in the first place – to compile a catalogue of microfoundations that significantly identified the maturity of logistics systems. The research technique that was chosen to collect primary data oriented at the development of the research model was the reconstruction and interpretation of the literature related to the subject among others: [Lasi at al. 2014; Gibson, et al. 2015; Schmidt at al. 2015; Asdecker, Felch 2018; Du et al. 2019; Zhu et al. 2020; Yue et al. 2020; Wang et al. 2020; McKibbin and Fernando 2020]. Such action – at the design level – made it possible to compile a general catalogue of competences underlying the design of the research tool in the form of an assessment sheet; the preparatory study conditioned the conduct of the actual study. In order to verify the accuracy of the selection of individual desiderata, another study was conducted using brainstorming. As outstanding experts were needed to identify competences, a number of guidelines were adopted in the methodology for selecting a creative team. It was assumed that the basic value of expert knowledge would be based primarily on the so-called "best

practices", i.e. examples of the practical application of knowledge.

A representative number of experts was selected to ensure the adequacy of expert assessments. When selecting experts, the key requirement was competence and experience in the area highlighted by the study. As the precision of decisions and assessments made by a small expert group can be considered as reliable as the evaluation of a large group, only 13 people were invited to the study (Table 1), although the experts' high level of knowledge allowed limiting their number to even five.

Table 1. Characteristics of the experts

EXPERT	Age				Education			Company size			Nature of production				Business form			Production process	
	31 to 40 yrs	41 to 50 yrs	51 to 60 yrs	above 60 yrs	Higher	Secondary	Vocational	Low	Medium	Large	Unit	Short-series	Mass	Batch	Self-employed	General partnership	Limited liability company	Own production	External production
A.S.				X		X				X				X			X	X	X
B.K				X			X		X		X	X	X			X		X	
B.P.	X				X				X		X	X		X			X	X	
B.W.	X				X			X				X			X			X	X
D.W.			X				X	X			X	X			X			X	X
G.W.				X	X			X				X			X			X	
H.K.			X		X				X		X	X			X			X	
I.K.		X			X				X			X	X			X		X	
M.S.			X			X			X				X		X			X	X
P.L.		X			X					X			X				X		X
P.N.		X			X			X			X	X			X			X	X
T.K.	X				X				X		X	X			X			X	
T.P				X		X			X			X		X			X	X	

Source: own development

In order to carry out expert research, a coordinator (author of the publication) was appointed, whose task was to organize the resources necessary to implement the project. At this stage, it was vital to establish a creative thinking team and ensure project sustainability until the implementation of selected ideas. Also, the preparation and dissemination of information on the research among the interested parties, taking into account the quarantine related to the present situation, was not a simple task. Due to the inability to organize a direct meeting, the so-called "Virtual" brainstorming was applied. Access to the "virtual" brainstorm system was possible through a computer connected to the Internet via a web browser, which allowed the application to become independent of the operating system. The use of IT tools eliminated the difficulties associated with organizing and conducting idea generating sessions. The combination of traditional group work methods with a computer system has created the opportunity to organize a meeting "on the web" and has influenced the positive effects of the search for ideas. Thanks to this solution – in order to select the best group of ideas – each invited user could present their suggestions (brainstorming), and other members of the "virtual" community could debate it (selection of ideas). After the end of the session, the author summed up the obtained results. The research coordinators wrote down all the listed competences, confronted them with the proposals of selected researchers, grouped similar ideas, which later on allowed to determine the final list of 61 resources and competences, which in the COVID-19 perspective may prove to be crucial from the viewpoint of the functioning of the supply chain.

The competences identified in the literature and design studies were further verified in the research procedure. In order to be able to

discuss the key ones (constituting the strongest determinants of maturity), it was necessary to reduce them by the method of expert organization (hierarchy/prioritization of importance implied by the current functioning conditions); it was assumed that the introduction of such a large number of variables would definitely complicate and prevent the formulation of significant conclusions. To achieve this goal, it was decided to conduct an additional preliminary study. To this end, an evaluation team, consisting of 6 purposely selected experts, was established (Table 2). The evaluation team was only composed of specialists involved in the problem being solved, which was verified on the basis of the competence coefficient determined according to the following relationship:

$$X = \frac{1}{2}(K_i + K_a) \qquad (1)$$

where $0 < K \geq 1$

Informativeness coefficient (Ki) was determined on the basis of an expert's self-assessment (from 0 to 10 points) multiplied by 0.1. The argumentation factor (Ka) was determined on the basis of an interview with a given expert. Competence expressing the expert's level of qualification in the field was determined on the basis of the expert's creative analysis, knowledge of the field and understanding of the issues raised in the paper.

Table 2. Characteristics of the evaluation team experts

Institution / Position	**Symbol**	**Specialisation**	**^{w}K**
Owner of a manufacturing company in the agricultural machinery sector (Fortschritt)	G.W.	Organization and Management	0.9
Supplier Relationship Manager (Granit Parts)	J.K.	Optimization of purchasing processes, integrated cost reduction; building relationships with suppliers	0.95
University Professor (University of Zielona Góra)	P.N.	Supply chain management	0.8
Centrum Superkomputerowo-Sieciowe (IT centre)	K.K.	Modelling of advanced applications, scheduling and resource management.	1.0
Vice director (Marshal's Office of the Greater Poland Province)	M.K.	Greater Poland development strategy and province program projects	0.8
IT Director –E-commerce (Internet Plus)	B.M.	SEO (positioning), PPC (on-line advertising), social media, copywriting, Web developers, link building.	1.0

Legend: ^{w}K - *Competency coefficient (expresses the relationship between the informativity coefficient [Ki] (knowledge of a given issue) and argumentation coefficient [Ka]).*

Source: own development

Based on expert suggestions, a list was drawn up consisting of selected descriptions of the maturity of logistics microfoundations. Considering the need to take into account known and traditional ideas, as well as a large number of new and original proposals, the criterion of materiality (the context of the issue taken) was adopted as the key one.

Basic study [BS]

The effect of COVID-19 seems to be further accelerated digitization. In the face of the pandemic, the digital revolution is accelerating, and at the same time companies can self-assess and determine which Industry 4.0 desiderata they can regard as promising in the future, and which of them should be subject to improvement.

The basic research was carried out on a sample of 53 enterprises representing the agricultural machinery sector. Respondents were selected in a targeted manner, assessing their "added value" on the basis of creative analysis of their activities and implementation of the strategic goals of the company from which they originate or for which they act. The implementation of research with the participation of experts seems appropriate,

especially in relation to those research areas that require advanced professionalisation (the author considers recognition of maturity in the face of the pandemic to be such an area). It should be emphasized that the area of research – specified in this paper – required those who take actions to have appropriate expertise (a randomly selected respondent may be deprived of it); especially since it concerns primarily problems in the field of professional activity. The application of expert interviews seems appropriate and desirable, bringing specific cognitive benefits and organizing the research process in a friendly and attractive way for the respondents themselves, which – from a 'qualitative' point of view – was also important.

The diagnosis was made among experts representing micro (11.32%), small (30.19%), medium (50.94%) and large (7.55%) manufacturing companies operating in the agricultural machinery sector. A group of people between 31 and 40 years old (32.08%) dominated among the respondents; 7.55% were respondents in the age group up to 30 years old, 28.30% of the respondents were between 41 and 50 years old, 20.75% were from 51 to 60 years old, 11.32% were over 60. The detailed results are shown in Table 3.

Table 3. Characteristics of experts in terms of age (N=53) – basic study (BS)

Bracket	Experts	
	Number	[%]
Uu to 30 years	N=4	7.55
31 to 40 yrs	N=17	32.08
41 to 50 yrs	N=15	28.30
51 to 60 yrs	N=11	20.75
above 60 yrs	N=6	11.32
In total:	N=53	100.00

Source: own development

Among the respondents, the group of persons with higher education clearly dominated (60.38%); 24.53% had secondary education, 15.09% had vocational education. Detailed characteristics are shown in Table 4.

Table 4. Characteristics of experts in terms of education (N=53) – basic study (BS)

Bracket	Experts	
	Number	[%]
Vocational	N=8	15.09
Secondary	N=13	24.53
Higher	N=32	60.38
In total:	N=53	100.00

Source: own development

Within the conducted research, an attempt was made to interpret the results and conduct a thorough analysis based on the respondents' declarations. A key stage was a description of the obtained data and its interpretation as highlighted in the further part of this publication.

RESULTS AND DISCUSSION

The descriptions identified in the literature and design studies were subjected to detailed verification. The collected results were analysed in terms of average values, while isolating those that were assessed by the respondents as important. In total, on this basis, a hierarchically compiled – according to the highest assigned significance/materiality (highest average) – model of resources, competences and tasks was determined, on the one hand determining the survival of enterprises in the conditions of COVID-19, on the other hand determining the maturity of logistics subsystems.

In the context of maturity assessment, seven descriptions were identified in the strategic management domain (Table 5).

The progressive increase in the difficulty and complexity of the operating conditions of modern enterprises affects the possibility of achieving the assumed action objectives. Making strategic decisions in conditions of uncertainty is implied by structuring the company's operations. The unpredictability of the environment affects the need to adapt short-term goals. Survival is considered to be the most general. Indeed, survival is a prerequisite for achieving the goals themselves, but survival in a rapidly changing

environment translates into slow dying of the enterprise – by achieving the survival goal, the enterprise must also be focused on developing and implementing an expansion-oriented business model. Regardless of what strategic choice the company makes, the business model should be formulated based on certain principles. This is particularly important during the COVID-19 pandemic due to the fact that these entities often choose their goals instinctively, without using formalized pre-emptive strategy building processes.

Table 5. Strategic management – relevance assessment of requirements

Item	DESCRIPTIONS	1	2	3	4	5	Avg.
		%					
STRATEGIC MANAGEMENT	Redefining the key goals of the organization (current status)	1.0	3.0	3.0	20.0	26.0	4.26
		1.9	5.7	5.7	37.7	49.1	
	Structuring of the company's activity	1.0	3.0	8.0	21.0	20.0	4.06
		1.9	5.7	15.1	39.6	37.7	
	Development of short-term action plans	-	2.0	8.0	22.0	21.0	4.17
		-	3.8	15.1	41.5	39.6	
	Development and implementation of the currently defined business model	-	3.0	5.0	22.0	23.0	4.23
		-	5.7	9.4	41.5	43.4	
	Establishing project teams; using flexible forms of working time organization	-	1.0	6.0	21.0	25.0	4.32
		-	1.9	11.3	39.6	47.2	
	Introducing solutions supporting the management of own and team time (work scheduling)	-	1.0	6.0	22.0	24.0	4.30
		-	1.9	11.3	41.5	45.3	
	Introducing new management methods and techniques (management through goals, management through tasks, etc.)	-	2.0	6.0	18.0	27.0	4.32
		-	3.8	11.3	34.0	50.9	

Source: own development

The desired effect of COVID-19 seems to be further accelerated digitization. This means eliminating a reduction in availability. For the vast majority of companies, we can observe a more flexible time or work organization that will allow to combine work with other duties. One of the most important skills that a manager should demonstrate in the era of coronavirus is managing the project team. Both the manager and his/her team members should know the basic methods of project management and techniques for their practical application in everyday work. It is worth, therefore, that every company should have an implemented risk management procedure together with a list of the most common problems in the industry, or a need to monitor work progress, preparation of a change and risk management plan, as well as the ability to identify, analyse and address emerging issues, which helps to prevent negative effects in times of crisis.

One of the priorities in the times of pandemic is planning daily work. Currently, there are many methods and ways to better organize work. In the current circumstances, however, there is a problem with the implementation of all planned tasks and performance of duties. Although technological development in recent years has contributed to the gradual dissemination of work-support technologies, significantly during the pandemic period, the usefulness of tools supporting own and team time management (work scheduling), including improving communication and data exchange in this regard, is voiced. The changing environment of the organization, uncertainty and risk force companies to look for management methods and concepts that will guarantee the maximum use of their material (work, capital, land) and intangible (intellectual capital: human, structural, relationships, knowledge, brand) resources. Attention is drawn to the need to retain customers, increase employee responsibility, efficiency and effectiveness of organization processes, as well as to ensure the functioning of the supply chain. Therefore, the implementation of modern solutions supporting decision making in chaos conditions and the introduction of modern technologies implying the possibility of remote work and automation of logistics processes is crucial.

When assessing the level of maturity in the field of supply logistics, seven identifiers were

highlighted (Table 6. Diversification of raw material supply sources, i.e. creating safe (stable) ways of obtaining them, especially in the face of a crisis, is an imperative task of every manufacturing enterprise. The scope (level) of diversification of supply sources should be adequate to a given situation. It is critical to ensure the stability of supplies in terms of timeliness, unchanging supply of raw materials and the awareness and certainty of the supplier's competence.

Table 6. Purchase management – relevance assessment of requirements

Item	DESCRIPTIONS	1	2	3	4	5	Avg.
		%					
SUPPLY LOGISTICS: PURCHASE POLICY	Supplier diversification (making the supply system more flexible)	-	-	4.0	19.0	30.0	4.49
		-	-	7.5	35.8	56.6	
	Qualification of suppliers	-	1.0	7.0	21.0	24.0	4.28
		-	1.9	13.2	39.6	45.3	
	Implementation of supply management procedures, i.e. accepting deliveries, verifying deliveries	-	2.0	7.0	19.0	25.0	4.26
		-	3.8	13.2	35.8	47.2	
	Management of material rotation, raw materials, semi-finished products in relation to the production offer and goods flows	1.0	2.0	7.0	17.0	26.0	4.23
		1.9	3.8	13.2	32.1	49.1	
	Introducing the purchase contracting model (obtaining priority order on the market)	1.0	-	5.0	18.0	29.0	4.40
		1.9	-	9.4	34.0	54.7	
	Implementation of the dynamic order flow management model (submission, verification and control of orders)	1.0	1.0	8.0	20.0	23.0	4.19
		1.9	1.9	15.1	37.7	43.4	
	Implementation of the purchasing group management model	-	2.0	9.0	22.0	20.0	4.13
		-	3.8	17.0	41.5	37.7	

Source: own development

Flexible adaptation to the situation only distinguishes the best suppliers. Increasing the order size, expediting the delivery date or expanding the product range of the order compose supply efficiency. The sustainability of solutions is of great importance in this case. Therefore, the qualification of suppliers plays a key role. When choosing a supplier, it is beneficial to get involved in long-term contracts, which will definitely allow to respond to the needs, especially in the event of unforeseen incidents. Qualifying suppliers affects the stability of the production process. Regardless of the situation, raw materials, production materials or components are likely to be delivered on time, in accordance with the adopted specification. In the context of a pandemic, it is postulated to have supply management procedures, i.e. accepting deliveries, verification (quantitative and qualitative, delivery statuses). It is reasonable to manage the rotation of materials, raw materials, semi-finished products in relation to the production offer and goods flows (achieving the priority of supply on the market). Among the surveyed companies, the need to introduce a purchasing contracting model, as well as a dynamic processing and order flow model (submission, verification and control of orders) can be noted. Aggressive enterprises appearing in the face of the crisis, which, among others, use low cost strategy, cause a situation that independent operation on the market becomes very difficult and risky. Grouping and creating multi-stakeholder organizations, such as purchasing/procurement groups, is becoming a very good solution. Motives arising from external threats and removal of internal difficulties associated with COVID-19 imply the legitimacy of creating a group, which jointly controls and improves material and information flows from suppliers. The use of mutual transactions allows to supplement material shortages, but above all to improve financial liquidity. Manufacturers can also take advantage of long trade credits granted by the central unit. They gain time to repay them and time to collect cash, which in the face of a pandemic significantly determines the possibility of their functioning.

When assessing maturity from the perspective of production logistics, seven descriptions were distinguished (Table 7).

Table 7. Production logistics – relevance assessment of requirements

Item	DESCRIPTIONS	1	2	3	4	5	Avg.
		%					
PRODUCTION LOGISTICS	Having a material base, own transport/logistics facilities	-	-	5.0	20.0	28.0	4.43
		-	-	9.4	37.7	52.8	
	Having new machines and devices, own manufacturing technologies	-	-	5.0	22.0	26.0	4.40
		-	-	9.4	41.5	49.1	
	Availability of own office/project team	-	2.0	8.0	22.0	21.0	4.17
		-	3.8	15.1	41.5	39.6	
	Active employees have the freedom to act	1.0	3.0	9.0	20.0	20.0	4.04
		1.9	5.7	17.0	37.7	37.7	
	Conducting research and development work	1.0	4.0	7.0	23.0	18.0	4.00
		1.9	7.5	13.2	43.4	34.0	
	Executive staff skills focused on multitasking; operation of many machines at the same time	1.0	1.0	5.0	20.0	26.0	4.30
		1.9	1.9	9.4	37.7	49.1	
	Ergonomics and safety in the field of applied technology and at the workstation	1.0	1.0	7.0	20.0	24.0	4.23
		1.9	1.9	13.2	37.7	45.3	
	Having technical means and automatic devices operating on the basis of self-control and operating without or with limited participation of human intervention.	1.0	2.0	4.0	16.0	30.0	4.36
		1.9	3.8	7.5	30.2	56.6	
	Production based on current demand resulting from orders; no actions based on forecasts	1.0	-	7.0	19.0	26.0	4.30
		1.9	-	13.2	35.8	49.1	
	The possibility of making tooling internally	1.0	2.0	7.0	16.0	27.0	4.25
		1.9	3.8	13.2	30.2	50.9	

Source: own development

In the context of the conducted research, attention was paid to the possibility of transferring the entire function of managing the manufacturing process to specialized devices, mainly computers, while partially leaving a certain range of these functions to people. This is especially important as one employee should operate several machines or several workstations at the same time. Therefore, all devices should work without the need of supervision; the ratio of the device's operating time to the service time must ensure handling another product. Attention should be paid to the correct determination of the technological process, the selection of starting materials as well as to machinery and equipment. The material stocks owned by the company that can be used in production processes ought to be taken into consideration too. It is imperative to own material base, transport and logistics facilities (it is postulated to keep inventory at 20% of annual demand). Also, much focus was placed on the implemented methods in the field of raw material processing, materials and objects, the manner tasks were performed and to have own machines, tools and devices used for processing and manufacturing. The implementation of the manufacturing process is favoured by the availability of own design team and the ability to execute internal tooling. The lack of ergonomics and safety at the workplace – especially in the era of a pandemic – is a significant barrier to the implementation of the manufacturing process. That is why it is fundamental to oblige employees to comply with the company's operating procedures that define the rules of conduct when performing specific tasks. The flexibility of a generating unit concerns the stage of production and is closely related to setting up the technological process and its implementation. The main conditions conducive to technological flexibility include the possibility of freedom of action for active employees, which is implied by the executive's understanding of the “lean” idea.

Taking up the maturity assessment from the perspective of customer service logistics, seven descriptions were distinguished (Table 8).

A system that efficiently implements all sales processes is the main factor affecting sales effectiveness in the conditions of overwhelming panic caused by coronavirus. Appropriate design of an application supporting customer service has a huge impact on the level of sales. Intuitive and easy-to-use sales platforms are very practical. Such an application should be fully scalable and allow

for its easy expansion with further functionalities. One of the possibilities to improve its functionality are integration with outsourcing support or services offered by external suppliers, but also other IT systems and applications used in the company. Depending on the needs of the manufacturer, but also the expectations of buyers, such integration, e.g. automates certain activities, saves time and reduces business costs. It also contributes to better customer service and builds trust. Real-time data synchronization reduces the risk of misinformation and the occurrence of an error, which is very easy in a pervasive pandemic.

When assessing maturity from the perspective of warehouse management, six descriptions were distinguished (Table 9).

Table 8. Customer service logistics – relevance assessment of requirements

Item	DESCRIPTIONS	1	2	3	4	5	Avg.
		%					
USTOMER SERVICE LOGISTICS:	Having sales platforms that are open for integration (panels: orders, customer, products, marketing, content management (CMS), customer and relationship management (CRM)	-	-	4.0	18.0	31.0	4.51
		-	-	7.5	34.0	58.5	
	On-line store platforms integrated with other internal systems, such as: Warehouse Management Systems (WMS), Enterprise Resource Planning (ERP),	-	2.0	4.0	18.0	29.0	4.40
		-	3.8	7.5	34.0	54.7	
	Editable and individually developable sales platform; ease of administration and operation	1.0	2.0	4.0	16.0	30.0	4.36
		1.9	3.8	7.5	30.2	56.6	
	An on-line store platform integrated with supplier systems, logistics services, external partners, advertisers, agents, customers, etc.	1.0	-	3.0	15.0	34.0	4.53
		1.9	-	5.7	28.3	64.2	
	Sales platform enabling product architecture management ("virtualization "of the offer)	1.0	2.0	5.0	17.0	28.0	4.30
		1.9	3.8	9.4	32.1	52.8	
	Availability of tools (including ICT) for contracting sales	1.0	3.0	5.0	19.0	25.0	4.21
		1.9	5.7	9.4	35.8	47.2	
	Availability of tools supporting electronic customer service; elements of transaction marketing	-	-	4.0	14.0	35.0	4.58
		-	-	7.5	26.4	66.0	
	Implementation of tools supporting communication with the customer; elements of relationship marketing	-	-	5.0	15.0	33.0	4.53
		-	-	9.4	28.3	62.3	
	Use of social media	-	1.0	7.0	17.0	28.0	4.36
		-	1.9	13.2	32.1	52.8	
	Dynamic mailing management (e-mail Automation)	-	2.0	7.0	17.0	27.0	4.30
		-	3.8	13.2	32.1	50.9	

Source: own development

Table 9. Warehouse logistics – relevance assessment of requirements

Item	DESCRIPTIONS	1	2	3	4	5	Avg.
		%					
WAREHOUSE LOGISTICS	Availability of Warehouse Management Systems (WMS), Enterprise Resource Planning (ERP), etc.	-	2.0	5.0	18.0	28.0	4.36
		-	3.8	9.4	34.0	52.8	
	Implementation of warehouse service standards (codification, cataloguing, bar codes, data collectors, data terminals, data flow automation); Optimization of internal warehouse logistics (product location, markings, entry, service and exit buffer)	-	2.0	5.0	15.0	31.0	4.42
		-	3.8	9.4	28.3	58.5	
	Introducing product base management functionality (item list, product groups and lines); integration with the sales platform	-	3.0	5.0	16.0	29.0	4.34
		-	5.7	9.4	30.2	54.7	
	Multidirectional data processing in the warehouse (minimum inventory, procurement of raw materials and materials); The functionality of dynamic management of inventory updates	1.0	1.0	5.0	16.0	30.0	4.38
		1.9	1.9	9.4	30.2	56.6	
	Standards for dealing with product defects at the level of assortment management (i.e. omissions, errors, low quality of products, incorrect markings, etc.)	-	3.0	6.0	17.0	27.0	4.28
		-	5.7	11.3	32.1	50.9	

Source: own development

The current trends in the field of warehouse services set directions in the field of automation of all kinds of work related to warehouse management. The basic tools of IT systems that support warehouse management are primarily Warehouse Management Systems (WMS). WMS class solutions are primarily used to coordinate warehouse work. They belong to highly specialized systems that streamline all processes in warehouses, which in the face of an existing pandemic greatly facilitates its functioning; especially during the period of increased number of diversified shipments directed to many recipients. WMS systems – with their technology – often support the Enterprise Resource Planning (ERP) management system. This system integrates key processes that take place in the company and provides a full picture of its activities. Efficient warehouse management, above all, means control over all processes taking place in the warehouse and proper handling of the accumulated inventory. The main activities are primarily the identification of goods arriving at the warehouse and proper storage, ensuring readiness for collecting and shipping in accordance with customer orders. Therefore, warehouse management should be supported by tools that imply its automation. In the context of the above, particular attention is paid to the implemented warehouse service standards (codification, cataloguing, bar codes, data collectors, data terminals, data flow automation). The new operating standards force the organization of product data and the implementation of solutions to facilitate product information management. All of it in order to develop even more towards the digitization of sales. In view of the above, there is much focus on the multi-directional data processing in the warehouse. The key feature is therefore the dynamic management of inventory updates. The implemented standards for dealing with product defects, as well as the optimization of the logistics system inside the warehouse (product location, markings, entry, service and exit buffer) are of particular importance. The proposed solutions allow the creation of product catalogues and their implementation in various sales and e-commerce channels. In this way, its main goal is achieved, i.e. content management in all channels and platforms from one administrative panel. Owing to which, one source of product information is available, which can then be shared with other IT systems, without the need to manually enter data in each channel again from the beginning. This enables the collection of diverse product data in one place, ensuring high quality information or faster and simpler creation as well as provision of descriptions that are attractive to recipients, which is a very important competence during a pandemic.

Table 10. Distribution logistics – relevance assessment of requirements

Item	DESCRIPTIONS	1	2	3	4	5	Avg.
		%					
DISTRIBUTION LOGISTICS	Integration of systems with external systems of freight forwarding companies supporting logistics (semi-automation or full automation of the order distribution process with the element of customer communication support, e.g. secondary statuses from operators, information on errors in delivery, operator flexibility in modelling shipment flow)	-	-	4.0	14.0	35.0	4.58
		-	-	7.5	26.4	66.0	
	Introducing the model of dynamic management of the progress path with the customer's order (flexible customer panel, statuses, notifications, feedback tools, etc.)	-	1.0	4.0	15.0	33.0	4.51
		-	1.9	7.5	28.3	62.3	
	Implementation of standards for exchanges and returns	-	2.0	7.0	16.0	28.0	4.32
		-	3.8	13.2	30.2	52.8	
	Introducing solutions in the field of order fulfilment and distribution, i.e. shipment	-	2.0	7.0	18.0	26.0	4.28
		-	3.8	13.2	34.0	49.1	
	Implementation of complaint management standards	-	2.0	6.0	18.0	27.0	4.32
		-	3.8	11.3	34.0	50.9	
	Introduction of packaging standards and preparation of final shipments. Workstation equipment and operation according to procedures	-	1.0	3.0	15.0	34.0	4.55
		-	1.9	5.7	28.3	64.2	

Source: own development

When assessing maturity from the perspective of distribution logistics, six descriptions were distinguished (Table 10).

The implementation of IT systems leads to an increase in the efficiency of enterprise service by rationalizing the forwarding department, concentrating all the most important logistics functions, as well as competences, in the organization and management of logistics processes. Moreover, IT systems supporting business management allow for ensuring high quality information used in decision-making processes. In this regard, attention is paid to the integration of systems with the external systems of freight forwarding companies handling logistics, use and application of standards for handling exchanges and returns, and the introduction of solutions in the field of order fulfilment and distribution. The standardization of complaint management and unified standards of packaging and preparation of final shipments is imperative. The complaint management process is one of the critical elements related to restoring the efficiency of sales processes. It affects the level of customer satisfaction and loyalty. It is also an element of communication with customers, which is why enterprises – of course not only during a pandemic – should treat this process with extreme care and use it as a strategic tool for business development.

SUMMARY AND CONCLUSIONS

Just as you cannot imagine the functioning of an enterprise without an adopted business model, it is impossible to build a mature logistics system without using modern technologies. This means that technologies, especially in the face of a pandemic, have become synonymous with an uninterrupted supply chain. The author hopes that research on the correlation between the degree of maturity of logistics subsystems and the productivity of enterprises contribute, even to a minimal extent, to the development of theoretical and empirical output, while generating consistent results regarding the direction and strength of this relationship. Thus, it is even more reasonable to propose a method of assessing maturity in this area.

This research paper might show companies the directions of introducing such solutions in the area of individual logistic subsystems, as the study indicates; with particular emphasis on digital competences that will ensure maximum productivity in the entire supply chain. Bearing in mind the current COVID-19 crisis, this is a desirable objective for management and quality sciences.

Table 11. Test results of the presumptions

Item	*Presumption*	*Test results*
P_1:	*In the face of the COVID-19 pandemic, manufacturers should exhibit a relatively high level of technological organization (digitization), especially within procurement logistics and customer service logistics.*	✓
P_2:	*The flexibility of the production process, also in the face of the COVID-19 pandemic, determines the application of solutions that are proper for the Lean Management concept.*	✓
P_3:	*The research model resulting from the expert discussion reflects the desired directions of activities that in the face of COVID-19 should absorb the surveyed enterprises.*	✓
P_4:	*The business model, in which digital technologies are the reference point, should imply the possibility of remote work, flexibility of working time organization forms as well as automation of supply, distribution and sales processes.*	✓

Source: own development

The gathered research material enabled to draw conclusions of a general and cognitive nature. The presumptions contained in the paper were fully confirmed by the theoretical and empirical arguments (Table 11).

To sum up, it should be acknowledged that the significance of digitization of logistics systems is considerable and cannot be underestimated by managers seriously thinking about effective action in such an uncertain

environment in which manufacturers have to currently operate. These systems allow to streamline work, reduce operating costs or expedite manipulation, and thus determine the ability to perform specific tasks. Therefore, it is necessary to agree with the statement that comprehensive – open to integration – systems play the role of a catalyst that, on the one hand, protects the maintenance of an adequate level of customer service and the survival of an enterprise, and on the other is an indicator of its maturity in the area of individual logistics subsystems.

The presented research do not exhaust the issue of maturity in the logistics processes, nevertheless it is vital so that they at least could become a guide for those who want to make changes in their company. It seems that relatively small scientific recognition and complexity of problems occurring in business practice justify treating these issues as the subject of research, which is reflected in this publication.

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REFERENCES

Antti M., Greenhalgh N., 2012. Leadership competencies: a reference point for development and evaluation, Library Management, 33(6/7), 421-428. http://doi.org/10.1108/01435121211266249

Asdecker B., Felch V., 2018. Development of an Industry 4.0 maturity model for the delivery process in supply chains, Journal of Modelling in Management, 13, 4, 840-883, http://doi.org/10.1007/978-3-319-67383-7-10.

Cheshmberah M., Beheshtikia S., 2020. Supply chain management maturity: An allencompassing literature review on models, dimensions and approaches, LogForum, 16 (1), 103-116. http://doi.org/10.17270/J.LOG.2020.377.

Ciesielski M., 2011. Zarządzanie łańcuchami dostaw [Supply chain management], PWE, Warszawa.

Cronemyr P., Danielsson M., 2013. Process Management 1-2-3 – a maturity model and diagnostics tool, Total Quality Management & Business Excellence, 24, 7–8, 933-944. http://doi.org/10.1080/14783363.2013.791114

Du Z., Wang L., Cauchemez S., Xu X., Wang X., Cowling B.J., Meyers L.A, 2020. Risk for Transportation of 2019 Novel Coronavirus Disease from Wuhan to Other Cities in China. Emerg. Infect. Dis., 26 (5), 1049–1052. http://doi.org/10.3201/eid2605.200146

Fawcett S.E., Wallin C., Allred C., Fawcett A.M., Magnan G.M., 2011. Information technology as an enabler of supply chain collaboration: a dynamic-capabilities perspective, Journal of Supply Chain Management, 47(1), 38-59. http://doi.org/10.1111/j.1745-493X.2010.03213.x

Gibson D., Ostashewski N., Flintoff K., Grant S., Knight E., 2015. Digital badges in education. Educ. Inf. Technol., 20, 2, 403–410. http://doi.org/10.1007/s10639-013-9291-7

Hammervoll T., Leif-Magnus J., Beske P., 2012. Dynamic capabilities and sustainable supply chain management, International Journal of Physical Distribution & Logistics Management, 42(4), 372-387. http://doi.org/10.1108/09600031211231344

Lasi H., Fettke P., Kemper H., Feld T., Hoffmann M., 2014. Industry 4.0, Business &Information Systems Engineering, 6, 239-242. http://doi.org/10.1007/s12599-014-0334-4

McKibbin W.J., Fernando R., 2020. The Global Macroeconomic Impacts of COVID-19: Seven Scenarios, SSRN Electron. J., 1-43. http://doi.org/10.2139/ssrn.3547729

Quintana C.D.D., Ruiz J.G.M., Vila, L.E., 2014. Competencies which shape

leadership, International Journal of Manpower, 35(4), 514–535. http://doi.org/10.1108/IJM-05-2013-0107

Rohloff M., 2009. Case study and maturity model for business process management implementation, International conference on BPM, Springer, Berlin-Heidelberg. http://doi.org/10.1007/978-3-642-03848-8_10

Schmidt R., Möhring M., Härting R. C., Reichstein C., Neumaier P., Jozinović P., 2015. Industry 4.0 - Potentials for Creating Smart Products: Empirical Research Results, [w:] Business Information Systems, W. Abramowicz (ed.), Springer International Publishing, Switzerland, 16-27. http://doi.org/10.1007/978-3-319-19027-3_2

Urbaniak M., 2010. Kierunki doskonalenia systemów zarządzania jakością [Directions of improvement of quality management systems], Wydawnictwo Uniwersytetu Łódzkiego, Łódź.

Wang C., Cheng Z., Yue X.-G., McAleer M., 2020. Risk Management of COVID-19 by Universities in China, Journal of Risk Financial Management, 13, 36, 2-6. http://doi.org/10.3390/jrfm13020036

Wendler R., 2012. The maturity of maturity model research: a systematic mapping study, Information and Software Technology, 54, 12, 1317–1339. http://doi.org/10.1016/j.infsof.2012.07.007

Wilden R., Gudergan S., 2015. The impact of dynamic capabilities on operational marketing and technological capabilities: investigating the role of environmental turbulence, Journal of the Academy of Marketing Science, 43(2), 181-199. http://doi.org/10.1007/s11747-014-0380-y

Yue X.-G., Shao X.-F., Li R.Y.M., Crabbe M.J.C., Mi L., Hu S., Baker J.S., Liang G., 2020. Risk Management Analysis for Novel Coronavirus in Wuhan, China, Journal of Risk Financial Management, 13, 22, 2-6. http://doi.org/10.3390/jrfm13020022

Zhu N., Zhang D., Wang W., Li X., Yang B., Song J., Zhao X., Huang B., Shi W., Lu, R. et al., 2020. A Novel Coronavirus from Patients with Pneumonia in China, New Engl. J. Med., 382, 727–733.

DEZYDERATY DOJRZAŁOŚCI PRZEDSIĘBIORSTW W OBLICZU PANDEMII COVID-19 - CYFROWA PŁASZCZYZNA MIKROFUNDAMENTÓW LOGISTYCZNYCH

STRESZCZENIE. **Wstęp:** W obliczu spowolnienia gospodarczego i znaczącej niepewności strategicznej będącej wynikiem panującego obecnie kryzysu epidemicznego SARS-Cov-2, zasadne jest podjęcie badań rozpoznających kompetencje kluczowe, istotne z punktu widzenia ciągłości funkcjonowania łańcucha dostaw. Procesy logistyczne w dotychczasowym kształcie ulegną bowiem istotnej zmianie. Dlatego też, na fali szerokiej dyskusji jaka się ostatnio toczy w środowisku naukowców, polityków, samorządowców czy praktyków zarządzania, po raz kolejny pojawia się pytanie o poziom przygotowania przedsiębiorstw do funkcjonowania w tym specyficznym otoczeniu. Dążąc do uzupełnienia istniejącej luki w wiedzy przeprowadzono cykl badań, których zasadniczym celem ustanowiono rozpoznanie kompetencji kluczowych z punktu widzenia egzystowania w warunkach kryzysu wywołanego COVID-19. Zważywszy na empiryczne dowody potwierdzające istnienie silnego związku pomiędzy stabilnością firmy a skutecznym łańcuchem dostaw, poniższy kierunek badań agreguje mikrofundamenty logistyczne do miana atrybutu „dojrzałego" przedsiębiorstwa.
Metody: W nawiązaniu do nakreślonego celu, wykorzystując metodę rekonstrukcji i interpretacji literatury przedmiotu, jako działanie niezbędne zarekomendowano nominowanie pytań opiniujących poziom dojrzałości podsystemów logistycznych (warstwa teoretyczna). Na płaszczyźnie koncepcyjnej (projektowej) kluczowe było skompilowanie narzędzia badawczego będącego wypadkową eksploracji piśmiennictwa (model teoretyczny) oraz dyskusji wśród celowo dobranych ekspertów („wirtualna" burza mózgów). Na płaszczyźnie empirycznej umożliwiło to rozpoznanie kompetencji przesądzających o przetrwaniu przedsiębiorstw w warunkach kryzysu i tym samym pozwoliło na opracowanie rekomendacji dla zarządzających przedsiębiorstwami wytwórczymi.

Wyniki: W pracy zaproponowano procedurę i narzędzie umożliwiające identyfikację kluczowych zdolności przesądzających o przetrwaniu przedsiębiorstw w warunkach kryzysu COVID-19. Model badawczy powstały w wyniku burzy mózgów odzwierciedla obszary technologii cyfrowej, które w kontekście obecnej pandemii powinni absorbować wytwórcy (koincyndencja). Ponadto ustalono, iż proces odbudowy gospodarki będzie odbywał się przy współudziale przedsiębiorstw absorbujących model zarządzania logistycznego oparty na technologiach cyfrowych. Reasumując trzeba nadmienić, że dojrzałość takiego przedsiębiorstwa przejawia się zastosowaniem - zdefiniowanych w badaniach deskryptów – nie tylko w zakresie wytwarzania, ale także w zakresie całego łańcucha dostaw. Wszystkie te działania wymagają zharmonizowania, tworząc przedsiębiorstwo „odporne" na kryzys. Organizacja takiego przedsiębiorstwa charakteryzuje się przekazaniem możliwie największej liczby zadań kompetentnym pracownikom, którzy przy wykorzystaniu wiedzy i dostępnych technologii cyfrowych dodają wartość w całym łańcuchu.
Wnioski: Wyniki badań utwierdziły autora w przekonaniu, że technologie cyfrowe z jednej strony implikujące możliwość przetrwana w obliczu kryzysu wywołanego COVID-19 (ciągłość łańcucha dostaw, praca zdalna bez udziału, lub przy ograniczonym udziale człowieka, itp.), z drugiej zaś implementowane przez przedsiębiorstwa, mogą stanowić swego rodzaju „tarczę ochronną" przed negatywnymi skutkami pandemii; z perspektywy podjętego w pracy zagadnienia stanowią o dojrzałości podsystemów logistycznych przedsiębiorstwa. Wydaje się, że stosunkowo małe naukowe rozpoznanie i złożoność problemów występujących w praktyce biznesowej uzasadniają traktowanie kwestii COVID-19 jako przedmiotu badań, czego wyraz stanowi niniejsza publikacja.

Słowa kluczowe: COVID-19, dojrzałość, podsystemy logistyczne, sektor maszyn rolniczych

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