



LOGISTICS MATURITY OF THE POLISH SERVICE SECTOR - RESEARCH RESULTS

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ABSTRACT. Background: The aim of the article is to demonstrate new methods for investigation of logistics maturity in service enterprises. The research assumes that logistic processes are implemented in service enterprises, which implies the possibility of developing a logistics maturity model for service enterprises in a theoretical aspect and the postulate that in economic practice there are different levels of logistics maturity of service enterprises and it is possible to identify them.

The originality of the presented research results from two aspects. The first aspect is of a methodical nature and concerns the logistics model used - LMM4SI, which is a proprietary tool that allows to assess the logistics maturity of a service enterprise. The second aspect is of a cognitive nature and is the scope and object of research, which are underrepresented in the literature. Some research concerns the development of a logistics maturity model and its application in the fashion industry. In Poland, similar studies are not being carried out, which a research gap is partially eliminated by the presented research. The results of the presented research concerned logistic maturity, defined as the organizational level of the enterprise, indicating the degree of use of logistics engineering in the areas of service enterprise operation.

Methods: The research methods used in the presented research are surveys that allowed to obtain primary data from 2,000 Polish service enterprises, mathematical analysis to determine the level of logistics maturity, and statistical analysis to make conclusions about the logistics maturity of the Polish service sector.

Results: As a result of conducted research an original logistics maturity model for the service industry (called LMM4SI) and the evaluation procedure carried out with its use. Realizing the cognitive aim of the article, the results of research on the logistics maturity of Polish service providers were presented.

Conclusions: The research results showed that service enterprises do not achieve high levels of logistics maturity. It was found that the developed methods allow for an effective assessment of the logistic maturity of enterprises.

Key words: logistics maturity, service sector.

INTRODUCTION

The number of service enterprises is increasing in Poland. According to data from the Central Statistical Office in Poland, in 2018 service enterprises constituted 54% of all enterprises. Amongst them, enterprises categorized as SMEs (micro, small and medium enterprises) dominate. In 2017, they constituted 99.8% of all Polish enterprises, with micro enterprises being the largest group (96%; 2 million).

According to the World Bank, in 2018 the service sector had more than 65% share in GDP. For this reason, service enterprises may be the object of scientific research in the area of their business activities, which most often relate to marketing, customer service and human resource management. However, research on the logistics activity of service providers is rare. This is primarily due to the difficulty of implementing logistics activities by service enterprises as the features of the service such as: Lack of ownership, Intangibility, Inseparability, Variability,

Perishability, User participation make service as a product not susceptible to logistics activities.

Despite this, service enterprises implement logistics processes, storing stocks of materials needed to perform services and transporting them to the place of service, cooperate within supply chains and use IT solutions associated with logistics.

The above elements are a motivation for undertaking research on logistics in the service sector.

The subject of the presented research is the logistics maturity of service enterprises. Maturity in management is defined as a measurement of the ability of an organization for continuous improvement in a particular discipline (as defined in O-ISM3) [Vicente 2017]. The higher the maturity, the higher will be the chances that incidents or errors will lead to improvements either in the quality or in the use of the resources of the discipline as implemented by the organization. Maturity can be assessed by means of Maturity Models (hereinafter referred to as MMs). In enterprise management, they allow to improve the planning of activities that should lead to expected results, i.e. to achieve the desired state or level of maturity. For enterprise management, they are a simple but effective way to measure processes. The concept of maturity models stems from software engineering and their application is spreading to other fields at an ever faster pace [Poepelbuss et al. 2011]. In addition, these models strengthen companies by providing them with the necessary operational conditions to manage organizational changes [Serna 2012]. MMs are regarded as tools for gradual and systematic demonstration of the development and/or improvement of general skills, processes, organizational structures and operating conditions [Blondiau et al. 2016]. MMs are used because in many cases the best way to modify the process is not that obvious. This type of model can be used as a multi-stage planning tool to identify which improvements in an organization should be made and when. The area that needs to be improved is assessed on the basis of MMs. Next, the evaluation result is used to determine

which improvements should be introduced to increase the level of maturity [Helgesson et al. 2012]. Although the MM approach began in computer science and software engineering, its application has spread to other areas such as the medical sector [McCarthy et al. 2014], supply chain management [Lockamy et al. 2014], education [Zhou 2012, Marshall 2011, Egberongbe et al. 2017], IT outsourcing [Gottschalk et al. 2006], e-governance [Misra and Dhingra 2002], project management [Kwak and Ibbs 2002, Grant and Pennypacker 2006], knowledge management [Serenko et al. 2016], business process management [Tarhan et al. 2016, Van Looy et al. 2011], enterprise interoperability [Campos et al., 2013] and MMs for Industry 4.0 [Schumacher et al., 2016, Ellefsen et al. 2019], Logistics 4.0 [Werner-Lewandowska and Kosacka-Olejnik 2019c] or in aspects of sustainable development [Golińska et al. 2015, Odważny et al. 2019]. According to the literature review [Kosacka-Olejnik, 2020], research in the field of logistics maturity and the development of a logistics maturity model is being conducted by Italian scientists: C. Battista, MM Schiraldi [Battista and Schiraldi 2013].

The object of the presented research was the Polish service sector. The service industry is currently the dominant source of GDP in the EU-28. According to Eurostat data [Eurostat 2020], the share of services in the total gross value added for the EU-28 amounted to 73.2% in 2018 compared to 72.2% in 2008. According to the quoted Eurostat data, the relative importance of services was particularly high in Luxembourg, Malta, Cyprus, France, the United Kingdom, Greece, the Netherlands, Belgium, Portugal and Denmark. In Ireland, Slovakia and the Czech Republic, the share of services in GDP averages around 60%. An increase in the number of service enterprises is observed in Poland, which brings the Polish economy closer to the Western markets model. According to data from the Central Statistical Office in Poland, in 2018 service enterprises constituted 54% of all enterprises, among which enterprises categorized as SMEs (micro, small and medium enterprises) dominate. In 2017, they constituted 99.8% of all Polish enterprises, and among them the largest group (96%; 2 million) were micro-enterprises [Zakrzewski and Skowrońska (ed.) 2019].

Polish SMEs run their business mainly in the service sector (52.3%), including 13.5% providing services in the area of professional, scientific and technical activities, 8.8% in the area of health care and social welfare, 7.5% in the area of transport and warehouse management.

The analysis of the share of Polish enterprises in the creation of GDP in terms of the economy sector showed that in the case of SMEs the service sector is the most important. Its share in the creation of GDP in 2016 amounted to 43.1%, compared with 29.2% for large companies. [Zakrzewski and Skowrońska (ed.) 2019].

In terms of the number of employees in Polish enterprises in 2017, enterprises from the service sector also dominated. When analyzing data concerning the average gross monthly salary (in PLN) per one employee according to PKD sections (Polish Classification of Economic Activities), it is concluded that the highest one is in the section assigned to the service sector, i.e. Information and communications. It is worth noting, however, that the lowest salary is in the section: Other economic activity.

The above statistical data on the Polish service sector prove that this is an area of the economy with high developmental potential, which is worth researching.

In 2018, the Polish service sector was dominated by professional, scientific and technical activities (19%), transport and warehouse management activities (12%) and other service activities (12%) [CSO 2019].

The presented summaries indicate a high degree of competitiveness in the service sector. The growing importance of services in the European economy is the result of technological progress, changes in the level of relative prices, outsourcing and globalization.

Justifying the undertaking of research on the logistics maturity of service enterprises, attention should be drawn to the relationship between these enterprises and logistics. Reflections on the current state of knowledge

about logistics maturity in service enterprises should begin with indicating the features of services, such as:

- Intangibility,
- Volatility - associated with volatile aesthetic and cultural sensations unable to be captured in time and space and which result from the uniqueness of services rendered even by the organizational unit itself [Gołemska and Tyc - Szmił 2008]. In logistics terms, volatility is complementary to the intangibility of services.
- Lack of storage possibility,
- Simultaneous production and consumption.
- All the listed features of services are assigned to them, regardless of the scope or type of services [Gołemska and Tyc - Szmił 2008].

The provision of services, regardless of their type, is accompanied by logistics processes that are carried out in parallel. As Gołemska and others point out, logistics processes accompanying the provision of the service should be managed in such a way that both the process of providing the service and the accompanying logistics processes create added value in time and space. The basic logistics processes in the sphere of services include: Supplies, including ordering raw materials, selection of suppliers, Warehousing (storage) of material resources used for the production of services, Inventory management, Transport, Packaging management, Order acceptance and service, Sales and customer service [Biesok 2013].

Logistics maturity in service enterprises should be evaluated because an intangible service requires tangible logistics support, without which it cannot be performed.

LOGISTICS MATURITY MODEL FOR SERVICE INDUSTRY - LMM4SI

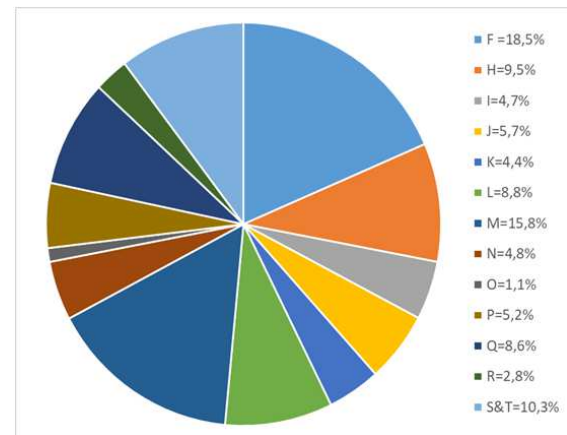
In response to the need to assess logistics maturity in the service sector, the Logistics Maturity Model for Service Industry (LMM4SI) was developed. The model assumes 6 maturity levels LML_m, $m \in \{1,2,3,4,5,6\}$ (hereinafter: LML_m), which correspond to

particular stages of logistics development in the economy, from the fragmentation phase to the Logistics 4.0 phase and are proposed in research carried out by R.H. Ballou [2007]. The level of maturity is determined in 5 areas of logistics activity (hereinafter: LA) undertaken by service enterprises such as: Warehouse management (WM for short), Transport management (TM for short), Supply and inventory management (SIM for short), Cooperation within supply chains and distribution (SCD for short) and in the field of IT solutions supporting logistics in the service sector (IT for short). The model assumes that the level of logistics maturity achieved by the enterprise is determined by logistics tools used in the enterprise, while the impact of individual tools on the levels of maturity can be different, which was expressed in the strength of impact [Werner-Lewandowska, Kosacka-Olejnik 2018]. 65 such tools were defined. Unacquaintance with more than 50% of tools indicates that the enterprise is not logistically mature (LML0).

RESEARCH OBJECT

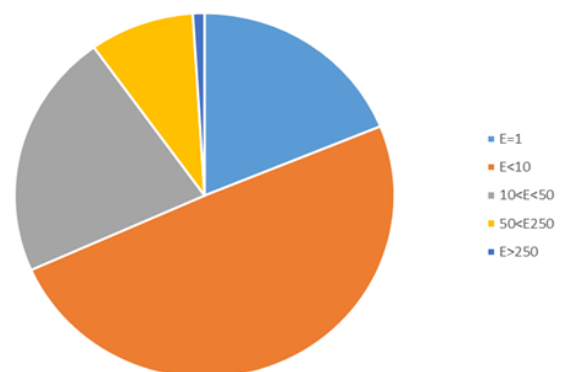
The research covered 2,000 Polish service enterprises from 12 sections according to PKD (Polish Classification of Economic Activities). The characteristics of the studied population by the type of service according to NACE (French Nomenclature statistique des Activités économiques dans la Communauté Européenne, Statistical Classification of Economic Activities in the European Union) are presented in Figure 1. In Figure 1, the individual letters are codes of service activity sectors, meaning in turn: F- construction, H-transportation and storage, I- accommodation and food service activities, J - information and communication, K-financial and insurance activities, L- real estate activities, M-professional, scientific and technical activities, N- administrative and support service activities, O- public administration and defense; compulsory social security, P- education, Q- human health and social work activities, R-arts, entertainment and recreation, S&T- other service activities and activities of households as employers; undifferentiated goods- and services-producing activities of households for one's own use.

The structure of the surveyed population included both micro, small, medium and large enterprises - Figure 2.



Source: own elaboration

Fig. 1. Structure of the surveyed population by industries according to NACE Rev.2.

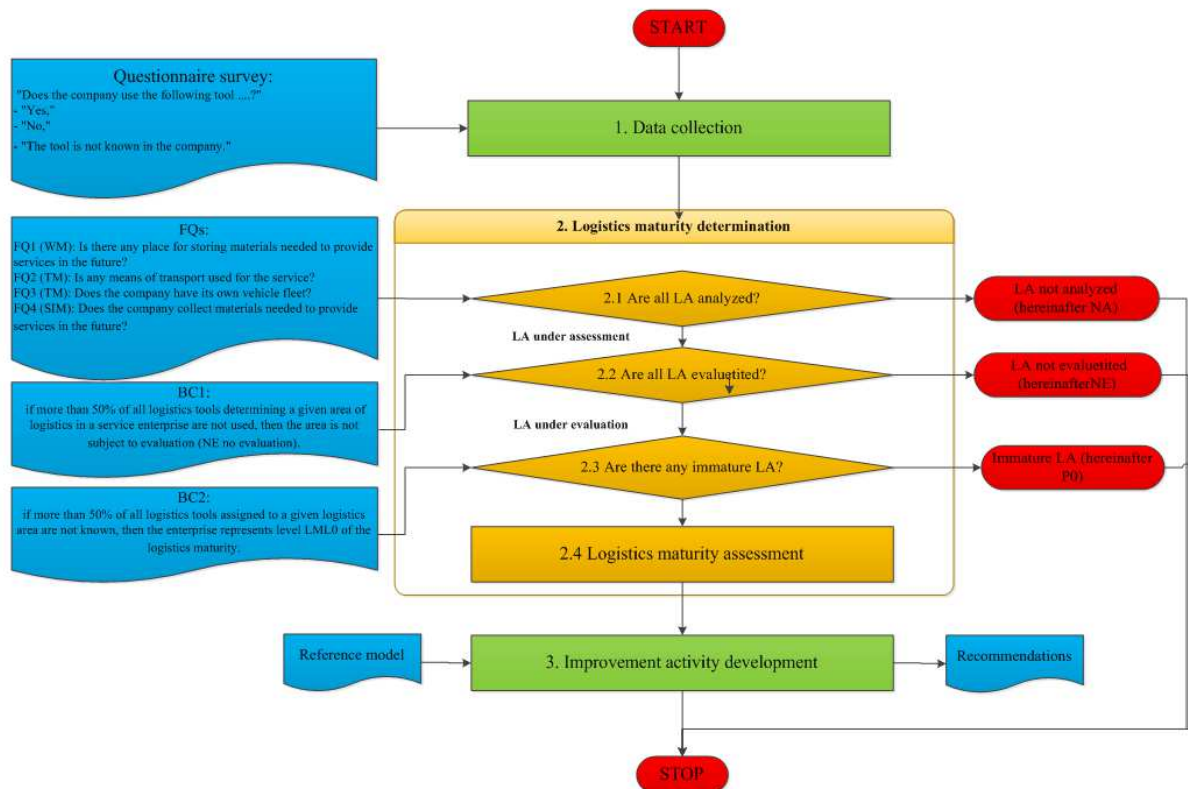


Source: own elaboration

Fig. 2. Structure of the surveyed population by employment level (E)

RESEARCH METHODOLOGY

The assessment of logistics maturity according to the LMM4SI is carried out according to the procedure presented in Figure 3. The procedure consists of 3 steps. The detailed description of this model can be found in research studies by Werner-Lewandowska and Kosacka-Olejnik [Werner-Lewandowska and Kosacka-Olejnik 2018, Werner-Lewandowska and Kosacka-Olejnik 2019a, Werner-Lewandowska and Kosacka-Olejnik 2019b, Werner-Lewandowska and Kosacka-Olejnik 2019c, Werner-Lewandowska 2019].



Source: own elaboration based on [Werner-Lewandowska and Kosacka-Olejnik 2019b]

Fig. 3. Stages in logistics maturity assessment with the use of the LMM4SI.

The research results presented in the article relate to Stage 2 of the procedure, i.e. they indicate the results regarding the determination of the level of logistics maturity of service enterprises.

The logistics maturity model – LMM4SI - developed in the research cycle, assumes that a service enterprise can achieve 1 out of 6 levels of logistics maturity in 5 areas of logistics activity. The determinant of a given level is the degree of use of logistics tools identical with a given area. In accordance with the procedure for determining the level of maturity according to the LMM4SI, the enterprise is not subject to evaluation in a given area of logistics activity in two cases:

- The area of logistics activity is not undertaken in the enterprise.
It was assumed that this applies to areas such as: Warehouse management, Transport management and Inventory and supply management. These are areas of logistics

activity that may not be present in a service enterprise. This, however, does not have to have a negative impact on the provision of services. A service enterprise may not maintain stocks of materials needed to perform services in the future or supply is carried out in a system, e.g. item for item. This results in not earmarking any space in the enterprise for storage. A service enterprise may also provide services without using internal means of transport. The identification of areas not evaluated for logistics maturity was planned in stage 1 in the survey questionnaire, which contained filtering questions (FQs in Fig.3). On the basis of answers to filtering questions in stage 2, it was determined whether a given area of logistics activity is subject to further analysis (in Fig.3 as NA-Not Analyzed).

- The BC1 condition is met, which means that the enterprise does not use more than 50% of logistics tools in a given area of logistics activity. Then the given area is not

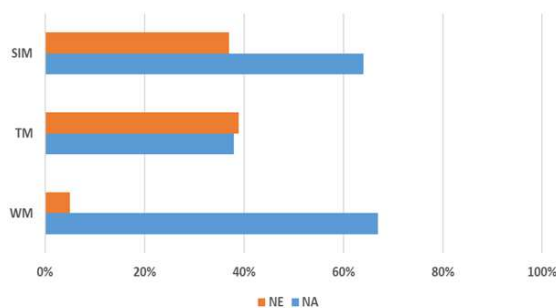
subject to evaluation (in Fig.3 as NE-Not Evaluated).

Based on surveys, it is also possible to indicate that a given enterprise does not know 50% or more of tools in a given area of logistics activity, which implies level 0 indicating logistics immaturity in a given area (in Fig.3, marked L0).

RESEARCH RESULTS

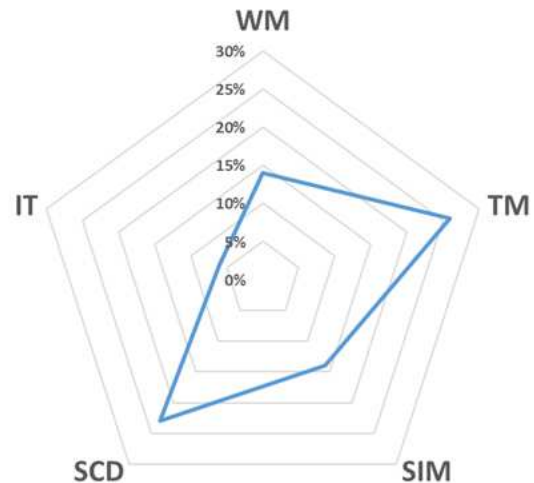
The conducted research indicates that in service enterprises, regardless of the service section, activities are carried out in the areas of storage, transport, supply and warehouse management, distribution and cooperation within supply chains. Their implementation is supported by IT solutions. However, as confirmed by the research (Figure 4), 67% of Polish enterprises do not have a designated area for storing inventories, i.e. the storage process is not carried out in the planned space or is not undertaken at all due to the lack of inventory of materials for future services, which is declared by 64% of the surveyed enterprises. Almost every fourth Polish service enterprise (38%) does not use external transport to provide services.

The conducted research showed that the Polish service sector is primarily immature in the area of Transport management. Nearly 30% of the surveyed enterprises do not know more than 50% of tools related to the management of means of transport (Figure 5).



Source: own elaboration

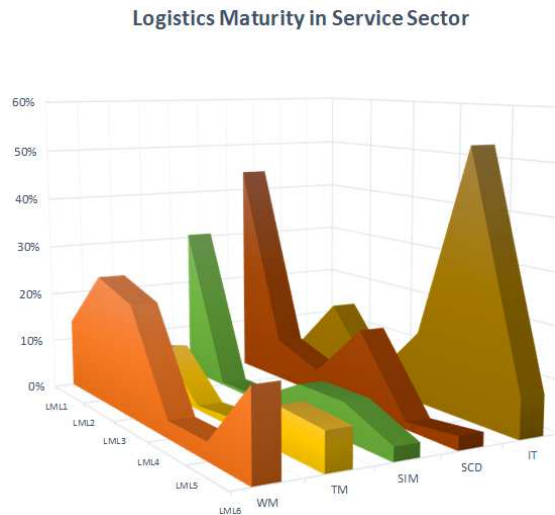
Fig. 4. Areas not analyzed or not evaluated in the study



Source: own elaboration

Fig. 5. Logistics immaturity of Polish service enterprises

Analyzing logistics maturity levels achieved by enterprises in individual areas (Figure 6), it can be stated that in the area of Warehouse management, the LML3 dominates, achieved on average by 20% of the surveyed population. In the area of Transport management, on average 34% of the surveyed population of service enterprises are logistically immature. In the area of Supply and inventory management, the LML1 dominates, achieved on average by 33% of the surveyed enterprises. Similarly, the LML1 is the most common level (44%) of logistics maturity in the area of Cooperation within the supply chain and distribution. The LML5 dominates in the area related to IT solutions in logistics, which was achieved on average by 48% of the surveyed enterprises. The highest level - LML6 - does not dominate in any of the analyzed areas, but is more often achieved in the area of Warehouse management due to the use of outsourcing in the area of storage space and transport management.



Source: own elaboration

Fig. 6. Logistics maturity of Polish service enterprises

As part of the undertaken research cycle, the correlation between the level of logistics maturity and the size of the enterprise and industry was examined. The presented results refer to the assumption that a minimum of 75%

of the surveyed enterprises in a given service section or a minimum of 75% of enterprises of a given size, expressed by an employment level, reach one of six levels of logistics maturity or are immature in this respect. The summary of the results of the correlation analysis are presented in Table 1.

As can be concluded from the conducted research, taking into account the percentage of enterprises (minimum 75%) that achieve a given level of logistics maturity in range of the highest LML6, there is no clear correlation with the service sector. This level is achieved by all enterprises in sections J, L, O and Q, N, M and P. The relationship resulting from the size of the enterprise is also not observed (measured by the level of employment).

As it results from the presented data, the LML6 is mainly achieved by micro enterprises (employing fewer than 10 employees or self-employed). This applies to areas related to Ware-house management, Supply and inventory management and IT solutions.

Table 1. Maturity levels of Polish service enterprises, including sections and employment levels

LA		F	H	I	J	K	L	M	N	O	P	R	Q	SiT
WM	E=1													
	E<10					LML2	LML6			LML6	LML5			
	10<E<50											LML3		
	50<E<250								LML3	LML3				
	E>250	LML2		LML2		LML2				LML3				
TM	E=1													
	E<10									LML1	LML5			
	10<E<50													
	50<E<250								LML6					
	E>250		LML1								LML6			
SIM	E=1						LML1			LML1			LML1	
	E<10				LML6									
	10<E<50						LML5	LML2	LML1	LML1				
	50<E<250							LML1	LML1					
	E>250	LML1		LML1		LML1				LML2			LML1	
SCD	E=1						LML1						LML1	
	E<10													
	10<E<50									LML2				
	50<E<250					LML2	LML1			LML1		LML2	LML1	
	E>250	LML1		LML1	LML1	LML1		LML6		LML4	LML1		LML1	
IT	E=1		LML5	LML5				LML5						LML6
	E<10				LML5						LML5			
	10<E<50				LML5	LML4		LML5						
	50<E<250			LML5		LML4			LML5					
	E>250			LML4	LML5			LML5			LML3		LML4	

Medium-sized enterprises achieve the LML6 in the range of Transport management and large enterprises additionally in the area

related to Cooperation within the supply and distribution chain.

The logistics maturity level 5 (LML5) in the area of WM, TM, and IT is achieved primarily by micro enterprises belonging to section P, which shows that enterprises providing Education services employing fewer than 10 employees achieve a high level of logistics maturity in the area of Warehouse management, Transport management and IT solutions. Micro enterprises from section P achieve the LML5 in 3 out of 5 areas.

The LML5 in terms of IT solutions used is achieved by most enterprises in sections J and M, regardless of their size, which makes these sectors susceptible to modern technologies used in business practice.

At the same time, it can be observed that the LML5 in the area of IT solutions is mainly achieved by micro enterprises.

As regards the LML4, no correlation between the service section and the size of the enterprise can be seen based on the research and results obtained.

The LML3 was achieved by the surveyed population of Polish service enterprises only in the area related to Warehouse management - small enterprises from section R (100%), medium enterprises from sections N (100%) and O (100%), and large enterprises from section O (100%). In addition, this level was achieved by 100% of large enterprises belonging to section P.

The LML2, in the area of warehouse management, is typical for large enterprises from sections F (75%), I (75%), K (75%) and in the area of transport from section O (100%). The LML2 also characterizes the logistics maturity of medium-sized enterprises in the field of Cooperation within supply and distribution chains from sections K (100%) and R (100%).

Service sections, according to PKD (Polish Classification of Economic Activities), which are characterized by the LML2 of logistics maturity are K, O, R, which achieve this level in 2 out of 5 examined areas of logistics activity.

The LML1 of logistics maturity is the most typical for section O - it is achieved in 3 of 5 areas of economic activity, such as: Transport management, Supply and inventory management and Cooperation within supply and distribution chains. The LML1 is achieved mainly by large enterprises employing over 250 employees.

Logistics immaturity, referred to in the model as the LML0, characterizes sections I and O - they show immaturity in 3 out of 5 examined areas. In terms of the size of the enterprise, logistics immaturity is primarily demonstrated by micro enterprises.

CONCLUSIVE REMARKS

The subject of the article was the presentation of the results of research on the logistics maturity of Polish service enterprises. The article presents the research background and the adopted methodology for assessing logistics maturity. An original logistics maturity model for the service sector – LMM4SI - was presented.

The conclusion resulting from the study indicates that Polish service enterprises do not achieve high levels of logistics maturity. The statistical data presented in the Introduction indicate a high degree of competitiveness in the service sector. This means that, as in the case of the industry and trade sector, regardless of their size, enterprises should strive to improve their functioning in order to become competitive in the market and increase profits. Logistics, considered by many to be a key success factor or a key competence, should also be viewed as an area for improvement. Separating logistics from the service sector, due to its intangible nature and volatility, does not seem to be the right direction in managing a service enterprise. It should be remembered that the provision of intangible services requires physical resources - materials that must be purchased, stored and transported. In addition, service providers are links in logistics chains. This role should result in taking actions by service providers to increase the effectiveness and efficiency of activities in individual areas of logistics activity, which will have a positive impact on the operation of

the entire logistics chain. It is postulated that the diagnosis of the level of logistics maturity of a service enterprise, made with the use of the LMM4SI procedure, should be the starting point for corrective and improving actions.

As directions for further research, the authors indicate sustainable logistics management in the service sector. In this area, they observe a cognitive and methodological gap.

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DOJRZAŁOŚĆ LOGISTYCZNA POLSKIEGO SEKTORA USŁUG - WYNIKI BADAŃ

STRESZCZENIE. Wstęp: Celem artykułu jest przedstawienie nowych metod badania dojrzałości logistycznej przedsiębiorstw usługowych. W badaniach założono, że procesy logistyczne są realizowane w przedsiębiorstwach usługowych, co implikuje teoretycznie możliwość opracowania modelu dojrzałości logistycznej przedsiębiorstw usługowych oraz postulat, że w praktyce gospodarczej istnieją różne poziomy dojrzałości logistycznej przedsiębiorstw usługowych i jest możliwe je zidentyfikować.

Oryginalność przedstawionych badań wynika z dwóch aspektów. Pierwszy aspekt ma charakter metodyczny i dotyczy zastosowanego modelu logistycznego - LMM4SI, który jest autorskim narzędziem pozwalającym ocenić dojrzałość logistyczną przedsiębiorstwa usługowego. Drugi aspekt ma charakter poznawczy w zakresie przedmiotu i obiektu badań, które są słabo reprezentowane w literaturze. Prowadzone dotychczas badania dotyczyły opracowania modelu dojrzałości logistycznej i jego zastosowania w branży modowej. W Polsce nie prowadzi się podobnych badań, przez co prezentowane badania częściowo eliminują tę lukę badawczą. Wyniki prezentowanych badań dotyczą dojrzałości logistycznej, rozumianej jako poziom organizacyjny przedsiębiorstwa, wskazujący na stopień wykorzystania inżynierii logistycznej w obszarach funkcjonowania przedsiębiorstwa usługowego.

Metody: Metodami badawczymi wykorzystanymi w prezentowanych badaniach są badania ankietowe, które pozwoliły na pozyskanie danych pierwotnych z 2000 polskich przedsiębiorstw usługowych, analiza matematyczna wykorzystana w celu określenia poziomu dojrzałości logistycznej oraz analiza statystyczna zastosowana na etapie wnioskowania o dojrzałości logistycznej polskiego sektor usług.

Wyniki: W wyniku przeprowadzonych badań powstał autorski model dojrzałości logistycznej dla branży usługowej (zwany LMM4SI) i przeprowadzona z jego wykorzystaniem procedura oceny. Realizując poznawczy cel artykułu, przedstawiono wyniki badań dojrzałości logistycznej polskich usługodawców.

Wnioski: Wyniki badań wykazały, że przedsiębiorstwa usługowe nie osiągają wysokiego poziomu dojrzałości logistycznej. Stwierdzono, że opracowane metody pozwalają na skuteczną ocenę dojrzałości logistycznej przedsiębiorstw.

Słowa kluczowe: dojrzałość logistyczna, sektor usług

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