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# Typology of Logistics Service Providers According to the Level of Innovativeness

## Summary

**Background:** this research aims to present a typology of logistics service providers (LSPs) based on the level of their innovativeness. It also attempts to examine whether particular generations of LSPs significantly differ from one another in terms of the undertaken innovative activities.

**Methods:** the data were collected through interviews of 55 managers in the logistics service sector. In the statistical analysis, the Kruskal-Wallis test was used. The level of innovation activity was measured by the number of implementations, taking into account a division between product, process, marketing, and organisational innovations. To assess the innovativeness, there was applied a summary scale, which was analysed in terms of homogeneity (Cronbach's alpha indicator) and standardisation (sten scores).

**Results:** based upon this, five types of LSPs were defined, i.e. entities with a very high level of innovativeness, high level of innovativeness, average level, low level, and very low level of innovative activity. Simultaneously, LSPs were also divided into three groups in terms of their competences relating to the logistics services and level of outsourcing (i.e. 2PL, 3PL, and 4PL). The group with the highest level of innovativeness is made up of foreign and mostly large-sized companies. The other distinguishing characteristics of this group are: global coverage, annual revenue above PLN 500 million, and the ability to provide a rich palette of developed logistics services.

**Conclusions:** the survey results show an immense diversity of the research sample in terms of innovative activities. One can assume that the leading LSPs are currently developing their offers and market competition methods. Logistics services' managers can use the typology in order to build the competitive advantage in the market. It also provides practical insights for supply chain managers by showing them the key role of innovation for selection of logistics service providers.

**Key words:** innovation, level of innovativeness, typology of logistics service providers, sten scores.

**JEL codes:** D22, L87, O30

## Introduction

This paper aims to combine logistics and innovation on the basis of innovativeness of logistics service providers (LSPs). In practice, the ability of the logistics providers to react quickly to changing market conditions depends largely on level of their innovation activity.

Many authors, for example, underline the key role of innovation for the development of logistics services (i.e. Cui, Shong-Lee, Hertz 2009, p. 45; Lin 2007, p. 23). Consequently, among the many benefits they indicate greater ability on part of the companies to differentiate their activities against the competition (Flint et all 2005, pp. 113-114) and intensification of the customer relations (Wagner, Sutter 2012, pp. 94-98). At the same time they emphasize the fact that innovation of the LSPs is still a poorly recognized phenomenon that should be looked into more carefully (Wallenburg, Lukassen 2011, p. 439). A more decided opinion is given by Wagner and Sutter (2012, pp. 94-98) who postulates that the research on innovation in logistics services is still in an early stage. For this very reason, following the results indicating low innovativeness of the logistics service providers in general (Busse, Wallenburg 2011, p. 188), this paper attempts to assess the degree of differentiation of the level of their innovativeness, taking into account a division between product, process, organizational and marketing innovations. One also tried to determine which generation of the LSPs is the most innovative one and what kind of implementations are usually made by them.

## Classification of the logistics service providers – theoretical background

In general, logistics service provider is a company specialised in satisfying diversified logistics needs of its customers. LSP is also known as a service provider which enters into relationships between two primary members of the supply chain. In addition, it is noted that LSP play an important role in strengthening the competitiveness advantage of the entire supply chain (Fulconis et all 2006, pp. 68-70). More precisely, regardless of the type of supported business, LSPs ensure a better logistics performance, i.e.: lower costs, higher quality of service, as well as increased flexibility (Świtała 2012, p. 55). In this way, they support not only the activities of their customers but also affect the level of satisfaction of other participants of the supply chain. The research indicates that this is one of the reasons why manufacturers and trading companies are switching from operating on their own to logistics outsourcing (Lun et all 2010, pp. 124-126).

Existing literature shows that there are many examples of classification of LSPs (Saglietto 2013, p. 106). Competences in logistics services are the most commonly used criterion of division. The classification developed by Lai (2004, pp. 394-396) can serve as good example of such a division. The author distinguished four different types of LSPs based on their operating service capability. This refers to: traditional freight forwarders, transformers, full service providers and nichers. LSPs may also be distinguished based on their ability to solve problems and adapt to customer needs (Płaczek 2012, pp. 149-150). Another criterion which may also be taken into account is the role played in supply chain by LSPs. In this case, as Jeszka (2009, pp. 65-67) emphasizes, the classification of LSPs is usually determined by the type of logistics collaboration. For example, Fabb-Costes and Roussat (2011, pp. 20-22) dis-

tinguished three classes of LSPs in supply chain integration, i.e.: facilitator LSP, integrated LSP and operational integrator LSP[1].

The literature review shows that the most common selection of LSPs is based on the concept of logistics outsourcing upgrade from 2PL to 4PLs. The term 2PL refers to the entity responsible for activities related to the physical distribution of goods. Carriers, freight forwarders and warehousing services providers are the most representative members of this category (Kersten et all 2008, pp. 240-242). 3PL is usually associated with a greater number of more complex and customized services, including – contract logistics services. It is worth mentioning that 3PL services are now the most valuable market segment. According to the research by Rohlig Suus Logistics, 1/3 of customers spend more than 1.5 million PLN on purchase of contract logistics (*Wspólny Manifest Logistyki* 2020 2012). It is often stated that 3PL providers have also exceptional adaptability for all sorts of customers' requirements (Lukassen, Wallenburg 2010, pp. 25-26), importantly, this type of features often constitute the basis for further classification. For example, Hertz and Alfredsson (2003, pp. 140-141) indicates the existence of four categories of 3PLs according to their operational capabilities, i.e.: standard providers, service developers, customer adapters and customer developers. Another type of LSP is called supply chain solution provider or 4PL (Bijam et. all. 2006, p. 134). The LSPs in this group coordinates the flow of goods, manage 3PL services and provides logistics management advice. Less frequently, the literature also distinguishes fifth party logistics provider. In this case, 5PL is described as an information provider serving customers in virtual space (Kempny 2012, p. 123). However, the lack of clear practical examples indicates that this type is purely theoretical.

## Research methodology

The research was conducted within the framework of the *Changes in inter-organizational relations in the supply chain influenced by innovative logistics solutions* research project. The data for the analysis were collected by means of an interview conducted with 55 representatives of the national logistics service sector. The sample selection was purposive. The survey questionnaire consisted mainly of scaled, closed-ended questions (ordinal and nominal scales). The questions concerning innovations covered a period of the last two years. When elaborating the survey results, one applied the SPSS program in the 20.1 version.

### *Description of the research sample*

The biggest part of the research sample was small and midsize enterprises (76.4%). Large enterprises were represented by 13 LSPs (23.6%). Micro enterprises were not included in the survey (one assumed that these entities did not usually implement innovations). The repre-

[1] There are also other ways to classify LSPs, such as: available resources, management skills, the ability of adding value or the scope of action. In short, the decision, which criteria are to be used, depends on the purpose of particular classification.

sentatives of enterprises participating in the survey were mainly the middle and higher-level employees. The respondents declared to be holding managerial positions in the logistics and customer service sector. Seven respondents held executive-level positions. The operational employees constituted 16% of the research sample.

The surveyed entities offered a complex and diverse range of services. On average, the entities offered more than 6 products ($\bar{x}$=6.32). The majority of enterprises offered 8 services (D=8). The services in the field of transportation, freight forwarding and storage predominate portfolio of the service providers. A large proportion of the respondents specialize in the provision of services based on knowledge, among others, logistics consultancy (49.1%) and controlling (36.4%). A high percentage of the enterprises also declare to be involved in a business activity in the sector of express delivery services (36.4%) and reverse logistics (34.5%).

Additionally, to obtain a better interpretation of the results, we divided our sample into three groups in terms of their competences relating to the logistics services and level of outsourcing. The following features were taken as the classification criteria: provision of transport and logistics services without a permanent service contract (2PL), customer service based on contract logistics (3PL) and provision of services in the scope of contract logistics and supply chain management (4PL). In fact, the gradation method applied in this analysis was the same as the method used in our earlier research. However, in that case we were focused on discovering whether LSPs differ in terms of marketing activities (Świtała 2013, pp. 153-159).

On this basis, 20 entities (36% of the respondents) were classified into the category of service providers referred to as 2PL. In the majority of cases these were providers of a few simple logistics services, acting as subcontractors, intermediaries between the subsequent stages in the supply chain. To process the orders, in particular transportation orders, the 2PL entities make use of their own fleet. The 3PL service providers were represented by 14 enterprises (25% of the respondents). The above described entities provide services for contract customers and offer a much richer scope of services, compared to the 2PL enterprises. In their offer one can also find value added solutions, such as green logistics, co-packing or in-house services, although one needs to emphasise that these kinds of services are provided only by a small part of the group. Compared to 2PL enterprises, the 3PL service providers are distinguished by a more developed (networked) organizational structure. The largest group of the research sample was made up by the 4PL providers (21 entities – 38%). This group consists of the most advanced contract service providers, which also fulfil the role of integrators / coordinators of the supply chains. Unlike the 3PL providers, the 4PL declare to possess more developed managerial skills, and in particular intellectual capacities required for the planning, organisation and supervision of the flows in the entire supply chain. On average, the 4PL service providers offer 9 products, i.e. nearly twice more than the 2PL providers (this difference is statistically significant) and considerably more than the 3PL providers. These service providers also possess a wider, and at the same time more dense, logistics network.

### *Innovation and innovativeness – definitions adopted by the author*

In this study as an innovative LSP should be considered a company which has implemented new solutions for itself (Niestrój, Świtała 2015, pp. 3-4). In this respect it does not matter whether they were developed by the implementing enterprise or were merely adopted (Wagner 2008, pp. 220-221). Also in the Oslo Manual (OECD 2005, pp. 48-49) one can find the definition of innovation, as a change which involve a significant degree of novelty for the firm. In accordance with this manual, innovation is the implementation of a new or significantly improved product (or service) or process, a new marketing method or a new organizational method in the economic practice, organization of the workplace or external relations. Furthermore, innovativeness can be understood as a kind of measurement contingent on an LSP's proclivity towards innovation (Salavou 2004, pp. 33-44). Basically, it means the capacity and tendency of a company to implement new solutions. In practice, the level of innovativeness is usually measured by the number of implementations or their monetary value and is often presented in the form of a raw score as a component of a larger model (e.g. Lin 2006, pp. 257-264; Lin 2008, pp. 19-38).

### *Measurement of innovations – construction of the scale*

In order to assess the level of innovativeness of the LSPs participating in the survey, one applied a summary scale, which takes into consideration the number of all four types of innovations (i.e. product, process, marketing and organizational innovations) implemented in the analysed period.

Initially 34 variables were selected for the survey. They reflected the extensive range of changes occurring in the sector of transport and logistics services, which in accordance with a definition presented in the Oslo Manual (OECD 2005, pp. 48-49) met the requirements of the occurrence of innovation (table 1). The measurement of innovation was performed with the application of binary nominal scales with the ''yes/no'' answers. The values obtained with the application of this scale ranged from 0 to 34.

All items in the scale were subjected to the analysis of homogeneity. To assess the reliability, one used the Cronbach's alpha index, which ranges from 0 to 1 (Mohsen, Reg 2011, pp. 53-55). Results above 0.6 indicate a high conformity of the measurement (Sagan 2004, pp. 94-95). If this number is larger, the scale is more reliable and the counted responses are more coherent. On the other hand, low results show that the answers given by the respondents are poorly related with one another (i.e. the results do not apply to one coherent issue).

Unfortunately, the original scale was characterised by a low level of reliability. For this reason, from the measurement one excluded ''not fitting'' items, i.e. items in case of which correlations with the whole scale assumed too low [computer network (0.013)] or negative values [EDI technology (-0.143), automation of internal material flow (-0.026), ERP software (-0.103), mobile applications (-0.068), e-orders (-0.017)], or did not demonstrate generally any correlation with the overall result [co-manufacturing services (0.000), WMS software (0.000)

and TMS software (0.000)]. Once the mentioned items were excluded, the value of the alpha index increased to 0.703. The obtained result confirms the high reliability of the scale.

**Table 1**

**Variables grouped according to the type of innovation**

| **Service innovations** (new services available in the offer) | **Process innovations** (new and implemented improvements) |
|---|---|
| (1) | (2) |
| green logistics services, logistics controlling, health care logistics, co-packing services, just-in-time deliveries, in-house services, co-manufacturing services, supply chain management, financial services | GPS, T&T system, EDI technology, RFID technology, automation of internal material flow, pick by light completion systems, pick by voice completion systems, computer network, ERP, WMS, TMS, CRM software, e-orders, e-warehouse, mobile applications |
| **Marketing innovations** (application of new marketing methods) | **Organizational innovations** (introduction of new methods in organization management) |
| (3) | (4) |
| rebranding, online marketing tools, social media marketing, mobile marketing | motivation system, ethical code, changes in the organizational structure, lean management and/or Kaizen principles, partner of scientific research programs and developmental works |

Source: authors' research.

In the next stage, the results of the newly developed scale were subjected to the normalization process. In the survey one applied the 10-point Sten scale, which is characterised by the following parameters (Boyle, Fischer 2007, p. 49):

- average ($\overline{x}$) = 5.5
- standard deviation ($\sigma$) =2.0

One sten is equal to 0.5 standard deviation. Each unit corresponds to a certain percentage of space under the observation distribution curve (Brzeziński 2003, pp. 541-543).

The procedure of the development of sten norms for a new scale was presented in table 2. The first column presents categorized raw scores for the applied innovation scale (as can be seen, one achieved results ranging from 0 to 14). Column 2 presents the number of raw scores, whereas column 3 (N SKUM) – cumulative numbers. In the next column (N SKUM/55) the cumulative numbers were divided by the total number of the observations. The results obtained in such a way were compared to the values corresponding to the normal distribution: 1st sten (0.000-0.023), 2nd sten (0.024-0.067), 3rd sten (0.068-0.159), 4th sten (0.160-0.308), 5th sten (0.309-0.500), 6th sten (0.501-0692), 7th sten (0.693-0841), 8th sten (0.842-0.933), 9th (0.934-0.977), 10th sten (0.978-1.000). On that basis, the sten norms were assigned to the results presented in column 4.

**Table 2**

**Sten norms for the innovation scale**

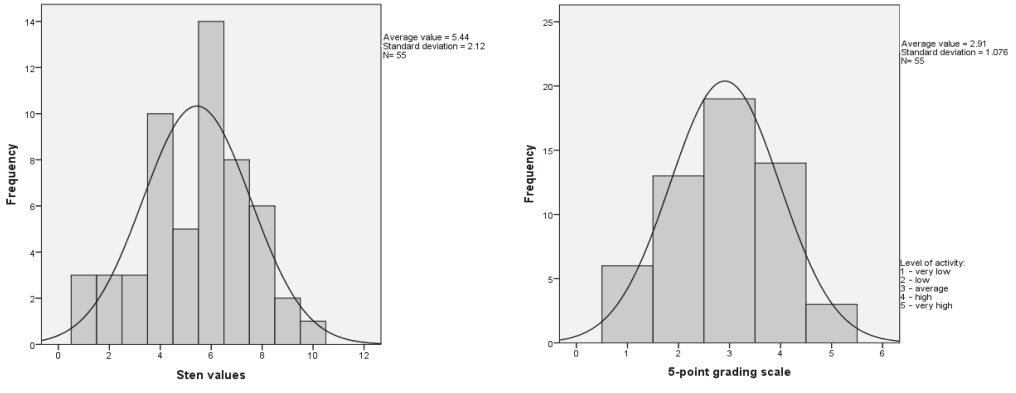
| RAW SCORE | N | N SKUM | N SKUM/55 | STEN |
|---|---|---|---|---|
| *(1)* | *(2)* | *(3)* | *(4)* | *(5)* |
| 0 | 3 | 3 | 0.055 | 1 |
| 1 | 3 | 6 | 0.109 | 2 |
| 2 | 3 | 9 | 0.164 | 3 |
| 3 | 10 | 19 | 0.345 | 4 |
| 4 | 1 | 20 | 0.364 | 5 |
| 5 | 4 | 24 | 0.436 | |
| 6 | 10 | 34 | 0.618 | 6 |
| 7 | 4 | 38 | 0.691 | |
| 8 | 3 | 41 | 0.745 | 7 |
| 9 | 4 | 45 | 0.818 | |
| 10 | 1 | 46 | 0.836 | |
| 11 | 6 | 52 | 0.945 | 8 |
| 12 | 1 | 53 | 0.964 | 9 |
| 13 | 1 | 54 | 0.982 | |
| 14 | 1 | 55 | 1.000 | 10 |

Source: authors' research.

The graphical distribution of the results after normalization was presented in figure 1.

**Figure 1**

**Distribution of the results after the procedure of normalization with the application of the sten scale**




Source: authors' research.

## Typology of LSPs Based on the "Innovativeness Level" Criterion

Empirical evidence collected through interviews supplemented by the results of sten scale analysis enabled one to identify within the research sample five homogeneous grups in terms of innovation activity (table 3). The results within the range: 1-2 sten are considered to be very low, 3-4 sten – as low, 5-6 sten – as average, 7-8 sten – as high, and results within the range 9-10 as very high.

**Table 3**

**Typology of LSPs according to level of innovativeness**

| Typological criterion | Level of innovativeness | Characteristics |
|---|---|---|
| *1* | *2* | *3* |
| 9-10 sten | very high level of innovativeness (n=3) | • total number of implementations: 39<br>• average number of innovations: 13<br>• product innovation activities: 100% of participants<br>• process innovation activities: 33,3% of participants<br>• marketing innovation activities: 100% of participants<br>• organizational innovation activities: 100% of participants |
| | | • logistics competences: 4PL (100%)<br>• average number of services: 12<br>• most commonly performed services: supply chain management services, contract logistics, logistics<br>• consulting, domestic and international transport, freight forwarding |
| | | • company size: large (66,7%), medium (33,3%)<br>• revenues: > 500 mln (100%)<br>• coverage: global (100%)<br>• foreign capital (100%) |
| 7-8 sten | high level of innovativeness (n=14) | • total number of implementations: 147<br>• average number of innovations: 10<br>• product innovation activities: 93% of participants<br>• process innovation activities: 71% of participants<br>• marketing innovation activities: 93% of participants<br>• organizational innovation activities: 100% of participants |
| | | • logistics competences: 4PL (50%), 3PL (29%), 2PL (21%)<br>• average number of services: 9<br>• most commonly performed services: transport, freight forwarding, contract logistics, logistics'<br>• controlling and consulting |
| | | • company size: small (43%), medium (28%), large (29%)<br>• revenues: 5 mln (46%), 5-10 mln (8%), 11-50 mln (8%), 51-100 mln (23%), 101-200 mln (8%), 301-500 mln (8%)<br>• coverage: regional (7%), international (86%), global (7%)<br>• national capital (57% ), foreign capital (36%), mixed (7%) |

| Typological criterion | Level of innovativeness | Characteristics |
|---|---|---|
| *1* | *2* | *3* |
| 5-6 sten | average level of activity (n=19) | • total number of implementations: 115<br>• average number of innovations: 6<br>• product innovation activities: 84% of participants<br>• process innovation activities: 26% of participants<br>• marketing innovation activities: 84% of participants<br>• organizational innovation activities: 90% of participants |
| | | • logistics competences: 2PL (42%), 4PL (37%), 3PL (21%)<br>• average number of services: 6<br>• most commonly performed services: domestic and international transport, contract logistics |
| | | • company size: small (47%), medium (37%), large (16%)<br>• revenues: 5 mln (50%), 5-10 mln (17%), 11-50 mln (11%), 51-100 mln (6%), 301-500 mln (6%), > 500 mln (11%)<br>• coverage: regional (26%), domestic (26%), international (48%)<br>• national capital (68% ), foreign capital (26%), mixed (6%) |
| 3-4 sten | low level of activity (n=13) | • total number of implementations: 38<br>• average number of innovations: 3<br>• product innovation activities: 31% of participants<br>• process innovation activities: 61,5% of participants<br>• marketing innovation activities: 69% of participants<br>• organizational innovation activities: 69% of participants |
| | | • logistics competences: 2PL (38%), 3PL (31%), 4PL (31%)<br>• average number of services: 5<br>• most commonly performed services: domestic transport, contract logistics, |
| | | • company size: small (38%), medium (31%), large (31%)<br>• revenues: 5 mln (36%), 5-10 mln (18%), 11-50 mln (18%), 301-500 mln (18%), > 1 mld (9%)<br>• coverage: regional (15%), domestic (39%), international (46%)<br>• national capital (77%), foreign capital (23%) |
| 1-2 sten | very low level of activity (n=6) | • total number of implementations: 3<br>• average number of innovations: 0,5<br>• product innovation activities: 0,0% of participants<br>• process innovation activities: 0,0% of participants<br>• marketing innovation activities: 16,7% of participants<br>• organizational innovation activities: 33,3% of participants |
| | | • logistics competences: 2PL (100%)<br>• average number of services: 3<br>• most commonly performed services: domestic and international transport, freight forwarding |
| | | • company size: small (83%), medium (17%)<br>• revenues: < 5 mln (50%), 5-10 mln (17%), 11-50 mln (17%), 101-300 mln (17%)<br>• coverage: regional (17%), international (83%)<br>• national capital (50%), foreign capital (33%), mixed (17%) |

Source: authors' research.

In accordance with above methodology, only 3 entities achieved **the highest result in the 5-point grading scale of innovation** (the 9th and 10th stens). These are enterprises distinguished by their innovative approach towards the management of changes an a proactive attitude as regards their surroundings. In this group one will find only the 4PL providers with foreign capital[2]. These are large enterprises with revenues exceeding PLN 500,000,000.00, which probably allows them to develop. Compared to their competitors, they are distinguished by a wide range of provided services ($\overline{x}$ = 12), as well as the global scope of their operations. It can be assumed with a high degree of probability that the most active LSPs aspire to be perceived on the market as providers of innovative logistics solutions. It is highly probable that for this very reason the surveyed companies started cooperation with external entities in the scope of research and development. In the respondents' opinion, such a contact constitutes an important source of future innovations.

In the group of entities characterised by a very high level of innovativeness, a total of 39 innovations were implemented. The obtained results highlight a wide range of the introduced solutions. On average each enterprise invested in 13 innovations. The largest number of innovations was observed in the area of organization management. The activities undertaken within the framework of organizational innovations were usually of comprehensive character and covered changes in the current organizational structure, HR policy and new forms of cooperation with the surroundings. The data analysis shows that all entities implemented the lean management concept in the analysed period, which confirms reorganisation of their previous business operations. The companies also developed new methods of employees' activation. The innovations were also implemented in the area of marketing. In the analysed period the respondents usually invested in new forms of communication with the customer, particularly in the development of e-marketing and mobile services. The survey results suggest that LSPs with a wider range of services spend much more time on improving their activities, rather than on launching new products on the market. Similar conclusions can be drawn with respect to technological innovations.

The next group covered 14 LSPs (just over 25% of the research sample). This group is formed by companies characterised by **an above-average innovation activity** (7-8 sten). Half of the population consisted of individuals belonging to the 4PL segment. The population also included 4 companies from the 3PL segment and 3 companies from the 2PL segment. The group included companies with the Polish capital (8 companies), entities representing foreign capital (5 enterprises) and mixed one (1 company). The level of employment varied, too, but usually it did not exceed 50 persons (43%). Mid and large-sized companies constituted 28.6% of the total companies.

The research shows that over the past two years respondents in this group have implemented a total of 147 innovations - on average 10 implementations for each company. Also in this case, the most frequently mentioned type of innovations were the organisational ones,

[2] Additionally, according to the research, there is also a statistically significant difference in the level of innovation between 2PL, 3PL and 4PL (p=0.02*). Multiple comparison test showed that there is statistically significant difference between 4PL and 2PL (p=0,006**). Furthermore, there is a difference close to the statistical validity between 3PL and 4PL (p=0,066~). It can be assumed that also in this case the 4PL are more innovative than the 3PL providers.

which accounted for more than ⅓ of all investments. In the analysed period the decisions taken on the most frequent basis related to the reconstruction of the organizational structure (> 90%) and to changes in the human resources management (a new motivation system was introduced by over 85% of the respondents and the code of ethics by 64%). Every second analysed company declared performance of activities according to the lean management principles. The same number of service providers declared an active participation in research and development programs. Product innovations were popular too. The data shows that the companies offered on average 9 services ($\overline{x}$= 8.71), of which ⅓ were market novelties. The respondents chose on the most frequent basis the following: logistics controlling (64%), supply chain management (43%), reverse logistics (43%), as well as in-house and green logistics services. Compared to the previous group, the respondents were more eager to differentiate and enrich the package of services provided by them. Investments in marketing innovations were declared by more than 90% of the respondents. The investment decisions related most often to: e-marketing (78%), presence of the company in social media (65%) and mobile marketing (50%). Only 64% of the research sample showed activity in process innovations. Among the solutions implemented on the most frequent basis, the respondents indicated: cargo flow monitoring systems (T&T, GPS), order completion systems and CRM software.

A group of companies characterised by **an average level of activity** (5-6 sten) included 19 service providers, of which over 84% was made up of small and mid-size companies. Compared to the previous two segments, one recorded a significant increase in the number of 2PL companies (8 entities) and companies with the Polish capital (13 entities). Usually the amount of the annual revenue did not exceed PLN 5 million (50%), although in two cases the revenue level was over PLN 500 million. Most respondents in this group operate in the domestic market. The average number of implemented innovations was significantly reduced. Only 6 implementations were recorded per one entity, over two times less than in the group of the leaders. The data analysis shows that the LSPs focused on three types of innovations: organizational ones (36 implementations), marketing ones (35 investments) and product ones (34 new services). In the case of process innovations one should emphasize both fewer investments (10) and the smallest percentage of the investors (26%). Changes in the product offer were associated with the expansion of the existing portfolio by more complex services, requiring both specific skills and extensive material resources. The respondents usually defined market novelties as reverse logistics, supply chain management and logistics controlling. Among the introduced organizational innovations, one saw on the most frequent basis changes in human resource management and organizational structure. As far as the new marketing solutions were concerned, one pointed most frequently to the implementation of e-marketing.

A group companies characterised by **a low level of activity** (3-4 sten) consisted of 13 service providers, including 10 companies with the Polish capital and 3 enterprises with foreign capital. The segment was formed by 5 small and 4 mid and large-sized companies. 2PL entities accounted for 38% of the research sample. The surveyees offered on average 5 logistics products on the market. One recorded a further decline in the number of innovations. On

average the companies decided to implement 3 investments in new solutions. The research shows that the respondents preferred to implement organizational and marketing innovations to the product and process ones. In the analysed period the companies implemented a total of 38 innovations - 17 organizational, 13 marketing, as well as 4 product and 4 process ones. As much as 70% of entities were not interested in the implementation of product or process innovations.

The group of companies with a very low level of innovation activity (1-2 sten) included 6 LSPs. Half of this group was made up of entities which did not consider it necessary to implement any innovations. Among the other ones, one reported only three cases of the introduction of new solutions. Compared to the most active entities, the number of implementations decreased several times, and the investments concerned exclusively marketing and organizational issues. Reluctance on part of the analysed companies to implement innovations, especially those requiring huge expenses can be explained by their weaker financial condition and worse market position. The research shows that this segment is only made up of small businesses which do not possess the 2PL company network structure. In the analysed periods, the companies earned small revenue from the sale of a basic package of services, mainly transport and forwarding ones. Also in this case, one noted unwillingness of the respondents to get involved in higher-risk projects.

## Conclusions, limitations and implications

Although only a small research sample was subjected to the survey, the obtained results show a large variation between the service providers with respect to the innovative activity. In the group of the respondents, the large 4PL enterprises may be considered leaders in innovations. They have the most developed logistics outsourcing offer and much wider opportunities regarding the services, compared to the less innovative 3PL and 2PL service providers. They stand out among other enterprises not only because of the larger number of implemented innovations, but also due to a wider scope and scale of activity. It should be added that LSPs with a leading position in the ranking are more inclined to implement further innovations, than the other respondents. They see opportunities for further development mainly in the intensification of research and development work, as well as in the reorganization of their operational activity.

The obtained results allow one to conclude that enterprises characterised by a high level of innovation have already gone through the stage of intensive changes related to the development of service offer and building the technological advantage. These companies attach much more attention to the improvement-related activities than to a design and introduction of completely new solutions to the market. The data analysis confirms that the service providers characterised by a low level of innovation preferred less expensive and less risky innovations. This group of innovations includes new marketing projects and changes in the work organisation (Starczewska-Krzysztoszek 2008, p. 9). This lesser interest in product and

process innovations may be explained by a worse financial situation and market position of the group.

It should be noted, that there is a limitation in the research. The test results, due to the small number of companies in the research sample, particularly within the distinguished subgroups, are rather exploratory and are to encourage one to conduct further, more in-depth research and analyses. Another limitation concerns the structure of the research sample, which was dominated by small and medium-sized enterprises. For this reason, further research should involve a larger sample of major logistics companies. It would also be interesting to look into the way the customers perceive the innovations of the service providers. Additional issue relates to the fact that the quantitative measure refers to limited number of 34 subjectively selected innovations. Thus, the tool needs further development by including other items to the existing components. It should also be noted that the level of innovativeness was assessed without taking into account the criterion of quality. Kraśnicka and Głód (2014, p. 205-207) see the imperfection of such a measure, arguing that with such a quantitative approach, one does not take into account the scope of novelty and value for the customer.

The topic of the paper is of interest for both academics and practitioners. Firstly, it gives an interesting insight into national logistics sector, which currently continues to be a growing business in this part of European logistics market (Fechner and Szyszka 2014, pp. 19-25). The conducted study enriches the current management knowledge on how LSPs react upon new opportunities and threats through innovation. The findings extend previous typologies of LSPs by focusing specifically on their innovation activity. Our research confirms that innovativeness is an important typological criterion that so far, has not been subject of any LSPs classifications.

The results concerning the level of innovation and competences of 3PL and 4PL providers can be successfully applied to benchmarking research in the transport and logistics service sector, particularly in the aspect of building the competitive advantage. In addition, supply chain managers (representing logistics recipients) should consider innovation activity as a key element during logistics outsourcing decision-making process. This remark seems to be important because past findings revealed that a large number of LSPs declare the fulfillment of comparable standards of service on the market (Świtała 2013, p. 98). In other words, this convergence increases the risk of selection of a competitive offer.

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## Typologia usługodawców logistycznych na podstawie kryterium innowacyjności

### Streszczenie

**Wstęp**: w artykule zaprezentowano wyniki badań, których celem było dokonanie gradacyjnego pogrupowania usługodawców logistycznych według poziomu innowacyjności. Podjęto także próbę odpowiedzi na pytania, czy poszczególne generacje usługodawców (tj. 2PL, 3PL oraz 4PL) istotnie różnią się od siebie aktywnością innowacyjną oraz jakiego rodzaju innowacje są przez nich najczęściej podejmowane.

**Metody**: dane do badania zebrano za pomocą wywiadów bezpośrednich na próbie liczącej 55 usługodawców logistycznych. Pomiaru innowacyjności dokonano na podstawie liczby podjętych innowacji, z podziałem na innowacje: produktowe, procesowe, marketingowe oraz organizacyjne. W standaryzacji wyników wykorzystano skalę stenową. Analizę rzetelności skali przeprowadzono za pomocą współczynnika α-Cronbacha. W analizie statystycznej wykorzystano test Kruskala-Wallisa.

**Wyniki**: w badaniu zidentyfikowano pięć typów usługodawców logistycznych, tj. podmioty o: bardzo wysokim poziomie innowacyjności, wysokim, przeciętnym, niskim oraz bardzo niskim poziomie aktywności innowacyjnej. Wyróżniono także trzy klasy usługodawców różniących się poziomem zaawansowania w obsłudze logistycznej. Usługodawcami o bardzo wysokim poziomie innowacyjności okazały się być duże przedsiębiorstwa z kapitałem zagranicznym. Grupę tę tworzą wyłącz-

nie firmy działające globalnie, generujące wysokie przychody oraz dysponujące najbardziej rozbudowanym wachlarzem usług logistycznych.

**Wnioski**: wyniki badań wskazują na duże zróżnicowanie badanej próby pod względem aktywności innowacyjnej. Jako zdecydowanych liderów innowacji można uznać usługodawców typu 4PL. Można także przyjąć, że czołowi usługodawcy logistyczni weszli obecnie w fazę doskonalenia oferty i sposobu konkurowania na rynku. Wyniki przeprowadzonej typologii posłużyć mogą do wzmocnienia przewagi konkurencyjnej usługodawców logistycznych.

**Słowa kluczowe**: innowacja, poziom innowacyjności, usługodawcy logistyczni, skala stenowa.

**Kody JEL**: D22, L87, O30

## Типология логистических услугодателей на основе критерия инновационности

### Резюме

**Введение:** в статье представили результаты исследований, цель которых заключалась в проведении градационного группирования логистических услугодателей по уровню инновационности. Предприняли тоже попытку ответить на вопросы, отличаются ли существенным образом друг от друга отдельные поколения провайдеров логистических услуг (т.е. 2ПЛУ, 3ПЛУ и 4ПЛУ) инновационной активностью и какого рода инновации чаще всего они предпринимают.

**Методы:** данные для исследования были собраны с помощью непосредственных интервью на выборке в 55 логистических услугодаталей. Измерение инновационности провели на основе числа предпринятых инноваций с разделением на продуктовые, процессовые, маркетинговые и организационные инновации. В стандартизации результатов использовали стеновую шкалу. Анализ надёжности шкалы провели с помощью коэффициента α-Кронбаха. В статистическом анализе использовали тест Крускала-Уоллиса.

**Результаты:** в исследовании выявили пять типов логистических услугодателей, т.е. субъекты с очень высоким уровнем инновационности, с высоким, средним, низким и весьма низким уровнем инновационной активности. Выделили также три класса услугодателей, которые отличаются уровнем прогресса в логистическом обслуживании. Услугодателями с очень высоким уровнем инновационности оказались предприятия с иностранным капиталом. Эта группа состоит исключительно из фирм, которые действуют в глобальном масштабе, генерируют высокие доходы и располагают наиболее широкой палитрой логистических услуг.

**Выводы:** результаты исследований указывают большую дифференциацию обследуемой выборки с точки зрения инновационной активности. В качестве ярких лидеров инноваций можно признать услугодателей типа 4ПЛУ. Можно тоже принять, что ведущие логистические услугодатели в настоящее время вошли в фазу совершенствования предложения и способа конкурирова-

ния на рынке. Результаты проведённой типологии могут служить укреплению конкурентного преимущества логистических услугодателей.

**Ключевые слова:** инновация, уровень инновационности, логистические услугодатели, стеновая шкала.

**Коды JEL:** D22, L87, O30

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