

## CHARACTERISTICS OF LOGISTICS SERVICE PROVIDERS AND THEIR SERVICES

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**ABSTRACT.** Services are becoming increasingly important in the economic life. Among them, the logistics services contribute to the successful implementation of the processes in many areas. This paper examined the main attributes, such as size, profile, ownership structure of service providers and the nature of their services. The paper found a wide variety of providers in all examined aspects: size, location, extent of activity. There were differences in the composition of the offers by the size and the ownership of the companies. The focus of providers showed a mixed picture. There were diverse and focused offers from small and large companies. In spite of the business challenge, the companies did not plan to change the company profile. The selection of their offers will not be changed in the future. The paper also examined the lead time of transport services.

**JEL Classification:** J23

**Keywords:** logistics, services, size – focus matrix, supply chain

### 1. Introduction

Logistics service providers play important role in supply chains. They are involved in almost all sectors with wide variety of services such as transport, storage, packaging and many other, adding more values to products and services.

While production companies – focusing on their own core competencies – use less kinds of operations (Skinner, 1974), logistics service operators have become more diverse by taking over additional tasks such as finishing products, operating distribution channels. Postponement centers are good examples for this. Modular production, vendor managed inventories also increased the importance of logistics activities (Walker, 2015).

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These two opposite trends raise the question: what kind of services are offered and will be offered by logistics service providers?

There are different logistics related players in supply chains: shipper, consignee, freight forwarders, courier companies (CEP: courier, express, parcel services). These parties cooperate in different combinations. The generally accepted categories are:

1PL: is done by the shipper or the consignee themselves. It can be a manufacturer, trader, importer/exporter, wholesaler, retailer, governmental institution or an individual.

2PL: is done by the actual, independent carrier. It is called 'asset-based carrier', which actually owns the means of transportation, warehousing. Typical 2PLs are transport companies.

3PL: a third-party logistics provider offers outsourced or 'third party' logistics services to companies. They offer multiple logistics services such as transportation, warehousing, cross-docking, inventory management, packaging, freight forwarding, customs clearing.

4PL: manages the whole logistics process, regardless of what carriers, forwarders, or warehouses are used. A fourth-party logistics provider (4PL) is an independent, singularly accountable, non-asset based integrator who combines the resources, capabilities and technology of its own organization and other organizations, including 3PLs, to design, build and run comprehensive supply chain solutions for clients.

5PL: can be defined as e-business related complex service provision. A 5PL provider aggregates the demands of the 3PL and others into high volume for negotiating more favorable rates with 2PLs. 5PL highly integrates the business processes of partners, and has direct impact on profitability.

An alternative category (mostly for the often debated 4LP interpretation) is LLP (lead logistics provider) which is a company that takes the full responsibility for organizing the whole transport chain from producer to their customers.

In this paper we present an analysis of the provision of logistics services in west Hungary.

## **2. Literature review**

Logistics services are among the oldest and most often used services. Peng (2012) emphasizes that "the good choice of service suppliers is the key to success in logistics outsourcing". According to Huemer (2012) "the last few years have seen increasing recognition of the work of logistics service providers, as well as the significance of functioning supply relationships".

According to Armstrong & Associates' Inc. "Eighty-six percent of Domestic Fortune 500 companies use 3PLs for logistics and supply chain functions". The annual growth forecast by Research and Market is 2.46 % over the period 2013-2018.

Logistics services are integrated deeper and deeper into supply chains, sometimes performing production tasks such as finishing products. In other cases, they play significant role in the organization and operation of supply chains, such as the management of the distribution or collection of products. Berglund et al. (2012) describe three waves of entrants into the 3PL industry and a taxonomy for value creation by logistics providers.

Today a logistics service provider (LSP) offers wide variety of services, such as materials management (including sourcing, transport, storage), value added services (assembly, installation) and many other, often non-logistics types of services (cleaning, maintenance, ICT services). LSPs can be seen that provide services, performing all or part of a client company's logistics function (Coyle et al. 2003; Delfmann et al. 2002).

Early research on 3PL was done by Larson and Gammelgaard (2001) in Denmark. Their results suggest that Danish logistics providers focus on the domestic market with limited scope. Firms offered a wide range of services, including transport in high ratio. Information systems and supply chain design had little share.

Numerous studies emphasize the opportunities in cooperation and collaboration especially regarding the value (co-)creation (Liu et al., 2015, Wang et al, 2016). Lieb and Lieb (2015) carry out 3PL survey among managers in the USA annually. They forecast the expected growth.

Outsourcing of the logistics function has become increasingly important and LSPs have been well positioned to turn into the indispensable links in the chain of commerce (Liao and Kao, 2014). Tarnai gave a good overview and classification of logistics services (Tarnai, 2004). She presented the concept of logistics centers in Hungary. This concept has become real only partly. Interestingly in certain areas such as ROLA, regression occurred. Originally three ROLA terminals were created. Today none of them work. There were also changes in the container traffic.

Hsiao et al. (2010) identified and analyzed the outsourcing of four levels of logistics activities: transportation (level 1), packaging (level 2), transportation management (level 3), and distribution network management (level 4). While the first is simple, the last is a complex with more added value.

United Nations sees development opportunities in logistics services. A good compilation – including definitions and classification - promotes the applications (UNESCAP, 2013). Customers might come not only from business. O'Connor et al. (2015) dealt with the urban and regional impacts of logistics services. They pointed out considerable functional and structural change within the services. In our sample we had also municipal firm and firms with urban interactions.

Classification of services helps the structured analysis. A previous research (Large and Kovács, 2001 p. 42) examined the customer side, the purchasing of logistics services. They made distinction between simple and complex services: "low-level logistics-services (e.g. a truckload transportation from point A to B, an individual warehousing service to open up a bottleneck in storage capacity or a simple exterior packaging service) and complex high-level contract logistics services covering a broader range of integrated service offerings. High-level logistics services consist of several types of logistics activities and include the co-ordination and control of these services. An example is the entire third-party distribution encompassing transport, warehousing, picking, packing, materials handling, inventory management and distribution resource planning."

The other option for classification is the role in supply chain, or logistics functions, such as purchasing, storage, material handling, distribution. They can be simple or complex.

The third option for classification is the distance of the services to logistics. There are services such as container or vehicle repair, equipment rent, accommodation that cannot be seen as logistics services, but they are offered by logistics service providers in or out of a logistics service package. In our research model we used all the classifications mentioned above. (Figure 1.)

Szabó et al. (2014) also examined the role of logistics services in municipal strategy including implications in regional development. This study is the direct forerunner of the presented research in this paper. Research and consulting companies such as Gartner, Aberdeen Group often publish reports on logistics services in practice (KPMG, 2009; Aberdeen Group, 2006, Report Linker, 2015).

However the importance of transport lead time is long-standing (Liao and Shy, 1991) and often (eg. Arikana et al., 2014, Fleischmann et al., 2014,) mentioned, there is no specific report about empirical investigation. Our analysis fills this gap.

### 3. The applied research database and methods

The research was exploratory in nature. The research was limited to a region covered by Zala county which is located in west Hungary. Companies working on the area were the main information sources. Statistical data helped to identify the population. Sampling aimed at to include the majority of the population of relevant logistics service providers in the examined region.

We have contacted 121 companies. 64 of them started to fill in the questionnaire, 53 of them were usable for this investigation.

Partly the literature review and partly previous results identified the range of services to be analyzed. Based on the existing services in the given region, only 1-3PL services were in focus. (4-5PLs often can not be bound to a certain geographical area.)

Local service providers and international operators were in the sample as well. 60 % of the samples are small and medium size enterprises (SME) (Table 1).

Table 1. Size distribution of sample based on the number of employees.

Company size (Headcount)	Percentage
1-9	30
10-49	30
50-249	25
over 250	15

We used Limesurvey for data collection, MS Excel and PASW Statistics 18 for data analysis, which included frequency, correlation and cluster analysis.

Questionnaire included information about the company, sectoral characteristics, the offered services, available infrastructure, application of ICT tools. In this paper we present the service provision related results. In this paper we deal with services related answers.



Table 2. The sectoral split of logistics service providers.

Sector	Percentage
Service	58.5
Trade	37.7
Industry	35.8
Automobile industry	26.4
Agriculture	22.6
Electronics	22.6
Food industry	15.1
Health care	11.3

Two-thirds (74 %) of the companies do not belong to a holding. Holding members have more employees (Table 3).

Table 3. Holding membership and size.

Does it belong to a holding?	Number of employees (Headcount)			
	1-9	10-49	50-249	>250
Yes	3	1	4	5
No	13	14	7	3

The generated revenue groups and relative frequencies can be seen in Table 4.

Table 4. Distribution of size based on the income from logistics services.

Annual revenue	Percentage
0-5 million HUF	17
5-20 million HUF	4
20-50 million HUF	13
50-200 million HUF	15
200-400 million HUF	17
more than 400 million HUF	34

More than half of the examined LSPs has international operation. It can be explained by the near border location, and partly by the holdings, and by the international customers such as General Electric, Flextronics, Honeywell, and oil industry ventures (Table 5).

Table 5. Distribution of service area.

Area covered by services	Percentage
International	57
Full domestic coverage	20
Partial domestic coverage	17
Small area coverage	6

Three out of the four neighboring countries are members of the European Union. It allows relatively easy cross border traffic, resulting a larger customer market. (The proximity of the borders itself generates export-import related logistics service demand.)

## 5.2. Service characteristics

Frequency of data shows that LSPs provide mostly traditional services such as unimodal transport and storage. The frequency of companies who offer multimodal transport is less than half of those who offer unimodal one (Figure 2).

We can observe also that simple services are dominant (Table 6).

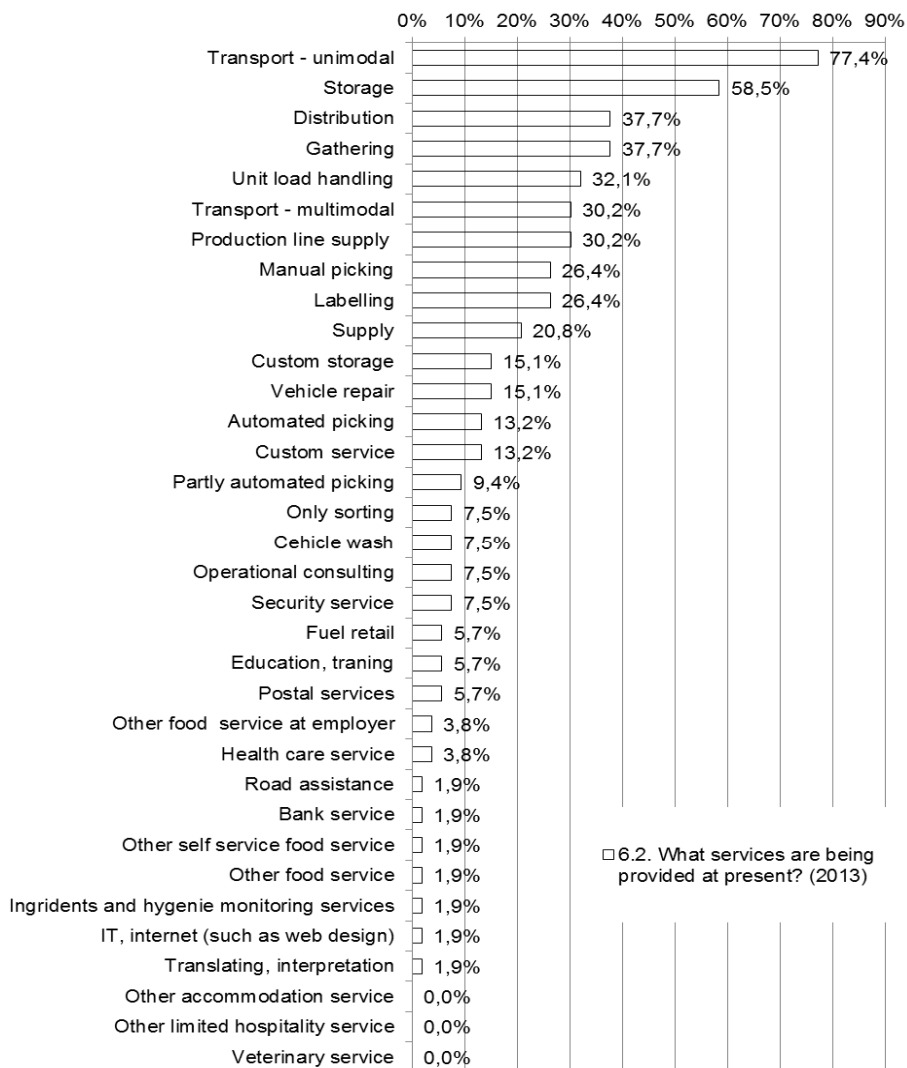


Figure 2. Distribution of provided services

Table 6. The predominance of simple services, small changes over time

Service	Simple/ Complex	Past	Present	Future
Storage	S	69.8%	58.5%	50.9%
Transport – unimodal	S	88.7%	77.4%	60.4%
Transport – multimodal	S	28.3%	30.2%	37.7%
Distribution	C	37.7%	37.7%	39.6%
Gathering	C	34.0%	37.7%	34.0%
Supply	C	15.1%	20.8%	20.8%
Production line supply	S	28.3%	30.2%	30.2%
Unit load handling	S	26.4%	32.1%	22.6%
Automated picking	S	11.3%	13.2%	17.0%
Partly automated picking	S	11.3%	9.4%	17.0%
Manual picking	S	32.1%	26.4%	15.1%
Only sorting	S	3.8%	7.5%	7.5%
Labelling	S	22.6%	26.4%	17.0%
Custom storage	S	17.0%	15.1%	15.1%
Custom service	S	15.1%	13.2%	13.2%
Vehicle repair	S	18.9%	15.1%	20.8%
Vehicle wash	S	9.4%	7.5%	18.9%
Road assistance	S	3.8%	1.9%	5.7%
Fuel retail	S	5.7%	5.7%	7.5%
Operational consulting	S	11.3%	7.5%	5.7%
Security service	S	7.5%	7.5%	7.5%
Bank service	S	1.9%	1.9%	3.8%
Other accommodation service	S	0.0%	0.0%	5.7%
Other self service food service	S	1.9%	1.9%	0.0%
Other food service	S	0.0%	1.9%	1.9%
Other food service at employer	S	3.8%	3.8%	1.9%
Other limited hospitality service	S	0.0%	0.0%	1.9%
Ingredients and hygiene monitoring services	S	1.9%	1.9%	3.8%
Health care service	S	3.8%	3.8%	5.7%
Veterinary service	S	0.0%	0.0%	1.9%
IT. internet (eg. web design)	S	5.7%	1.9%	5.7%
Education. training	S	9.4%	5.7%	7.5%
Translating. interpretation	S	1.9%	1.9%	5.7%
Postal services	S	5.7%	5.7%	7.5%

We asked not only about the presently offered services, but offerings in the past and their plan in the future. Table 6 also shows that there were little change in the past and willingness to change in the future. The planned change in the case of one specific service can be noticeable, however the implication for the whole profile is not significant, 1-2 %. One can assume that in this case the forecast error is comparable to the experienced difference.



The correlation between the size of company (based on the number of employees) and number of provided services shows an interesting picture. The correlation coefficient between the size group rank (which is not rational) and the number of provided services is 0.478,  $p=0.00$ , significance=100%. Large companies have the capability to offer more kinds of services.

However not each of them does it. Some of them stay focused. Figure 3 shows on a rational scale that large companies (in the highest number of employee group) provide wide variety of services. Small business are diversified beyond proportional.

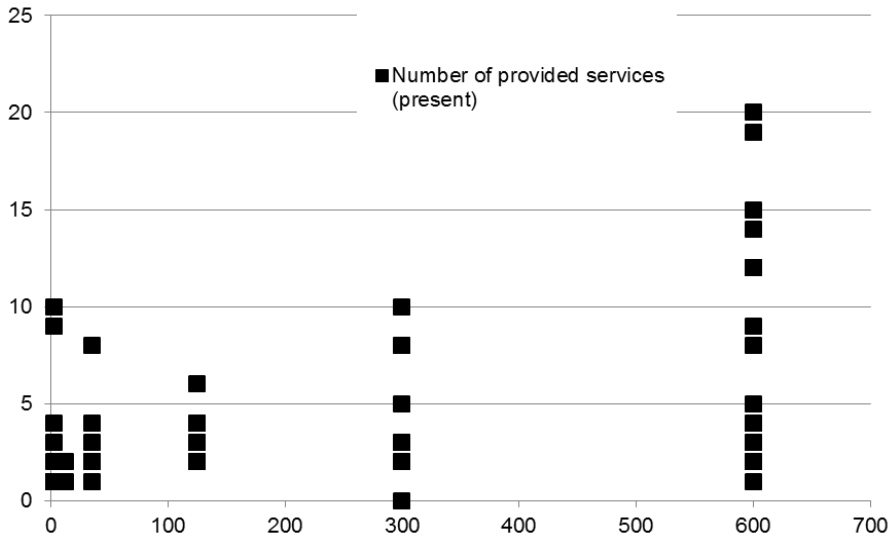


Figure 3. Larger companies (by number of employees) can be more diversified or stay focused.

In this case the correlation coefficient is 0.471,  $p=0,004$ . The maximum number of services show linear regression, with the exception of the non focused small companies. (On the left side of the diagram.)

When we see the LSP size based on the revenue, it reinforces that thesis. (Table 7. shows frequencies in the sample.)

Table 7. Larger companies by revenue can be diversified or focused as well.

Number of provided services	Revenue (million HUF)					
	0-5	5-20	20-50	50-200	200-400	>400
1	4	1	1	0	1	1
2	1	1	3	3	2	3
3	1	0	1	2	2	2

Number of provided services	Revenue (million HUF)					
	0-5	5-20	20-50	50-200	200-400	>400
4	1	0	1	2	0	2
5	0	0	0	0	1	1
6	0	0	0	1	0	0
7	0	0	0	0	0	0
8	0	0	1	0	2	1
9	1	0	0	0	0	1
10	1	0	0	0	1	0
11	0	0	0	0	0	0
12	0	0	0	0	0	3
13	0	0	0	0	0	0
14	0	0	0	0	0	1
15	0	0	0	0	0	1
16	0	0	0	0	0	0
17	0	0	0	0	0	0
18	0	0	0	0	0	0
19	0	0	0	0	0	1
20	0	0	0	0	0	1

It is interesting, that both small and large companies (based on revenue) offer mostly less than five kinds of services. It can be seen clearly also that only large companies are able to offer large number of services. While in the case of SMEs focusing is a must, in the case of large companies, it is a decision.

In order to classify the ventures based on the number of services we carried out cluster analysis. Result – dendrogram in Figure 4 - shows that the reasonable number of clusters is 4. Companies 7-8. create a small group, almost 'lonely wolves'. They are large international companies, offering 19 and 20 kinds of services. The next greatest number of services is 15, went to an other group.

The next cluster includes five companies: 40, 41, 21, 28, 35. They are midsize, internationally present companies, which have one or two main (core) businesses and other services.

Eight companies 17, 30, 29, ... 1, 2 offer 8-10 services. They are midsize logistics service providers or logistics part of a company with other main profile such as trade.

The largest group consists of 38 companies. They are focused based on their own decision or due to the lack of capabilities.



However the result of cluster analysis suggests that there is a tie between the size of covered (geographical) area and number of services, the Pearson correlation coefficient 0.13, ( $p=0.34$ ) does not prove that hypothesis. The reason can be that larger area is covered by large companies which are more focused.

Focusing can be examined inside the transport. The number of transferred cargo type is a good indicator. Frequencies in Table 8 show that some large companies are really focused while others transport more type of cargos.

Table 8. Transport activity of large companies is more focused than their small competitors'.

Number of cargo types	Revenue (million HUF)					
	0-5	5-20	20-50	50-200	200-400	>400
0	2	0	3	0	0	1
1	2	1	2	1	2	7
2	2	0	0	3	3	4
3	0	0	2	0	1	1
4	2	1	0	1	1	0
5	1	0	0	1	1	0
6	0	0	0	1	0	3
7	0	0	0	1	1	1
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	0	0	0	1

In the right (>400) column - which represents large companies - more companies ( $7+4+1=12$ ) transfer 1-3 type of goods than 4-10 goods (5 companies). This means focusing. However large number of cargo type (>6) occurs at large companies. It comes from their technological enablers.

The correlation coefficient between the number of cargo types and the revenue of the company is 0.181,  $p=0.196$ .

What kind of materials, products are transported?

Almost 2/3 (60%) of the companies (with transport profile) transfer palletted cargo. Surprisingly high (almost 40%) is the ratio of wrapping material, such as boxes. Food and furniture equally mentioned (30 - 30%). Then the ranking: bulk cargo (24.5%), chemicals (22.6%), postal parcel and dangerous goods (17 - 17%), automobile (15%), waste (9.4%). It does not draw far-reaching conclusions. This share depends on the economic structure of the examined region.

Lead time of services is an important effectiveness indicator. We defined it as the time in workdays between sending the order and shipping. Figure 5 shows the distribution of transport lead time in normal case, when there is no delay or urgent request.

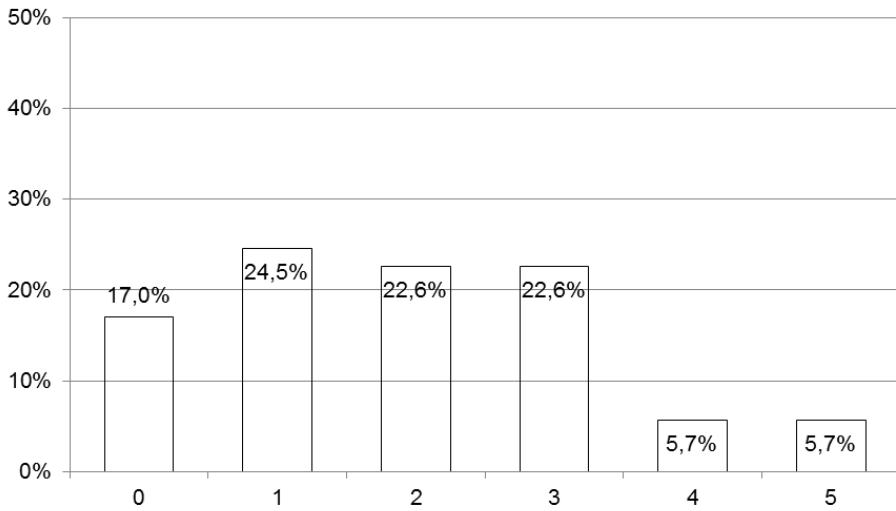


Figure 5. The distribution of transport average lead time.

Most often (24.5%) LSPs start the shipping the following day of the order, however in 17% they start it on the same day.

We asked not only the distribution in normal case, but optimistic and pessimistic values also. Figure 6 shows the values. (Due to the combination of two diagrams, we used frequencies.)

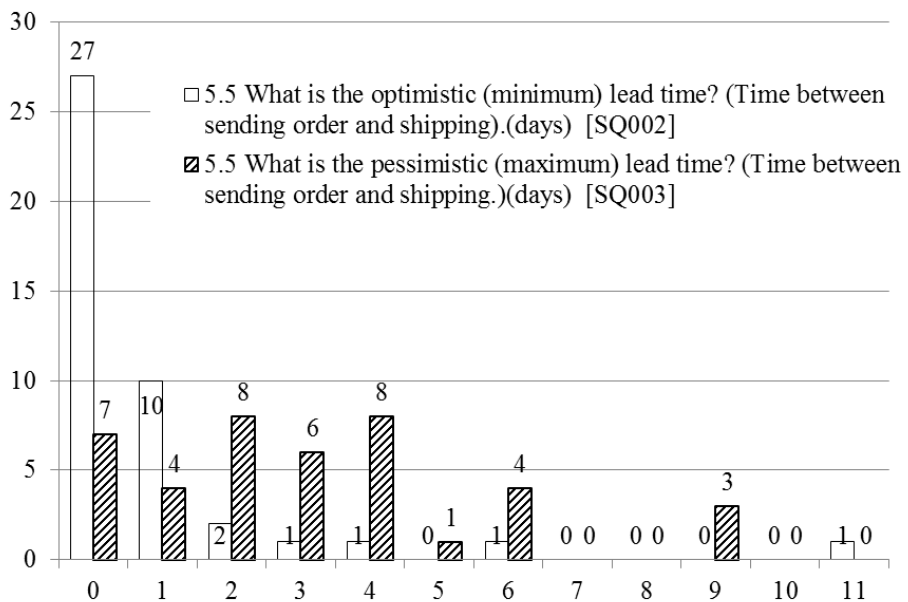


Figure 6. Distribution of lead time in best and worst case.

## 6. Conclusions

The last decades were spent focusing on the world of production. However logistics service providers took over more and more activities from producers, such as purchasing, warehousing (VMI!) raw material or finishing, labelling, distribution of products.

Our results show a mixed picture. They do not confirm the trend of the increasing rate of complex services in the examined geographical area. There is not a high ratio at present, and it is not anticipated by the providers to change. Still transport and storage are the most popular services. However it is interesting that the fourth most popular service is complex, namely the distribution. It seems that the situation is similar to what Carbonea and Stoneb (2004) found few years ago: "A few market leaders offer a wide range and scope of services, while most other firms have a diversified portfolio of interests." The 'wide range' has different meaning in European and county scale of course.

Services loosely related to logistics in categories "additional" and "other" are present in the sample at low rate. It might come from the lack of large, diversified logistics centers.

Regarding the focus we can classify the LSPs based on the size and focusing/diversification as Table 9 shows.

Table 9. Size – focus matrix.

		Determinant	Focus	
			Low	High
Size	Small	Limited internal resources	Customers' demand (Effectiveness)	Efficiency
	Large	Internal decision	Depends on decision. Fits to the available (more or less) capabilities such as resource and technology limitations.	

In the case of small companies focusing would be the natural behavior due to their limited resources, such as capacity, variety of available technologies. In spite of that some of them force the diversification, possibly in order to meet customers' demand. They sacrifice efficiency in order to survive.

In the case of large companies 'diverse or focus' is a decision to make. They may choose 'and' (both in different times), instead 'or'.

The average lead time is not bad. Hopefully large values came from the international transports. (We did not ask relation specific times.)

Strange that responders can not see changes for the future. It is hard to believe – especially on the way coming out of an economic crisis situation – that there would not be changes in customer needs. Rather the poor willingness and ability of planning and the necessary forecast can be the explanation. It is not local characteristics, Crisan et al. (2010) pointed out similar problems.

Capgemini Consulting annually performs surveys of 3PL logistics (Capgemini, 2013). The 2013 survey result is shown in Table 10. The Capgemini study provides more detailed picture than others because it examines the different regions separately and provides aggregate result.

The other similar investigation is the above mentioned KPMG study (KPMG, 2009), however there is a time gap in between. Table 10 shows the ranking of provided services based on the frequency.

Table 10. The comparison of investigations.

This study (2013)	Capgemini (2013)	KPMG (2009)
Transport – unimodal	International transportation	International freight forwarding
Storage	Domestic transportation	Warehousing
Distribution	Warehousing	Domestic freight forwarding
Gathering	Freight forwarding	Value added services
Unit load handling	Customs brokerage	Custom services
Transport – multimodal	Reverse logistics (defective, repair, return)	Domestic transport
Production line supply	Cross-Docking	Logistics planning
Manual picking	Product labeling, packaging, assembly, kitting	International transport
Labelling	Transportation planning and management	Supply chain management
Supply	Inventory Management	Reverse logistics
Custom storage	Freight bill auditing and payment	After sale logistics
Vehicle repair	Order management and fulfillment	International distribution

The comparison is made difficult by the fact that KPMG study asked about value-added services separately. Their ranking:

- repackaging, labelling,
- inventory recordkeeping,
- kitting,
- barcoding,
- assembly, configuration,
- vendor managed inventory (VMI)
- paying
- billing,
- receiving, handling order.

These researches show strong transport and related activities. Complex services are not as strongly present as they were expected before.

Mitra (2006) argues that major problems to the growth of the 3PL market are the lack of trust and awareness. It is an cultural issue.

Min (2013) presents the outsourced services from customer view. His ranking is based on the share of a certain outsourced service. This rank differs from the LSP's ranking of offer:

- customs clearance/brokerage
- port services
- freight bill audit and payment
- freight forwarding
- import/export documentation
- shipment consolidation/in-transit merge
- shipment tracking/event management
- freight brokering
- security management
- inbound traffic control
- e-logistics/
- e-(online)purchasing

The complete set of services overlap with those that we have discovered.

There are information about the type and volume of cargos, vehicles, applied technologies in the database. It allows further analyses such as the usage of ITC tools by logistics service providers.

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