Abstract
Logistic services are evaluated most of all by measuring the customer satisfaction. A measurement of satisfaction provides information on operations of an organization and effective meeting needs of customers. The aim of this paper is to evaluate the quality level of logistic services provided in the field of road refrigerated transport of various groups of products.

Four basic groups of products whose transport requires controlled temperature, such as: food products (fruits and vegetables), food products (meat, fishes, eggs and dairy products), frozen foods and deep-frozen foods, and also medicinal products, which are subject to legal conditions, were evaluated. Survey subjects were 249 company representatives (logistic purchasers). The Wilcoxon test was used to define the dependence of the evaluation of the quality of logistic services regarding transport of four product groups on the evaluation of particular features of logistic services having influence on the customer satisfaction.

Keywords:
logistic services, quality services, refrigerated transport, food products

1. INTRODUCTION
There is no definition of the quality of logistic service in the literature. However, the quality of service related to transport has been normalized and is defined as „a set of quality criteria and appropriate means for which the service provider (the individual declaring that they will meet the requirements) is responsible” [5]. The following notions related to service quality have been included in the norm PN-EN 13816:2004:
– the offered quality of service, the achieved level in the presence of objectively measurable criteria,
– the perceived quality of service, the customer feelings about the quality of the provided service,
– the expected quality of service, the level required by the customer, implicitly or explicitly,
– the intended quality of service, the level which the service provider is planning to achieve.

The quality of service can also be defined as „the degree to which a set of inherent qualities meets the requirements” [6]. The term connected with quality is, among others, the notion of the customer contentment defined as „the customer perception regarding the degree to which their requirements have been met” [6].

Taking into account the above definitions, one may assume that the quality of logistic service is determined by the degree to which the set of typically logistic quality criteria and the condition of relevant technical measures, for which the service provider is responsible, meet the requirements.

Enterprises providing logistic services in the scope of road refrigerated transport in Poland are obliged to observe the legal conditions regarding transport of items requiring controlled temperature.

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1 Inherent, understood as opposed to „assigned”, means residing within the essence of something, especially as a constant feature related to a requirement. A requirement is a need or expectation which has been established, habitually accepted or is obligatory [6].
2 The customer contentment is identical to the customer satisfaction.
The legal requirements regarding logistic services within transport, including refrigerated transport, can be divided into the following thematic groups: transport of cargo, transport of food products, transport of frozen or deep-frozen food products and transport of medicinal products [2]. Studies on the quality of logistic services are considered in the works of, among others, authors such as: [3], [4], [9], [10], [8], [1].

2. OWN RESEARCHES

The conducted direct studies had a quantitative character. To accomplish the research objectives, a survey questionnaire was prepared. It was addressed to 1321 entities and the answers were received from 269 purchasers of logistic services in the scope of refrigerated transport.

As the customer contentment is identical to the notion of the customer satisfaction, it was important to know the opinions of service purchasers regarding the level of their contentment in terms of the quality of these services. Fig. 1 presents percentage indications regarding the contentment level as a result of the quality of logistic services in refrigerated transport.

![Fig. 1 Level of the contentment of the quality logistic services in the field of refrigerated transport (% of indications)](image)

Based on the results, one may conclude that the vast majority of the respondents, as many as 76%, is pleased by the level of the offered logistic services and believed that firms specializing in transport of items requiring controlled temperature are characterized by a very high level of quality of provided logistic services. In turn, the percentage of the service purchasers who were not glad of the offered logistic services and thought that enterprises rendering services in the scope of road refrigerated transport are characterized by a very low level of quality of logistic services was barely 4%. Yet, a large group of study subjects (about 20%) were undecided and unable to unambiguously define the level of logistic services offered in the field of refrigerated transport in Poland. It may suggest that, as customers were not able to unambiguously define the level of quality of logistic services, they might not pay much attention to the offered quality of logistic services in refrigerated transport, which is rather unlikely, or their knowledge is insufficient in this field and this group of respondents did not decide to even try to make an unambiguous assessment.

An important aspect of the studies was to learn about the opinions of the service purchasers regarding the quality level of logistic services depending on the kind of transported goods. Fig. 2 shows average ratings of the quality level of logistic services with respect to the type of transported products requiring controlled temperature.
Fig. 2 Evaluate the quality level of logistic services in the field of refrigerated transport of various groups of products whose transport requires controlled temperature (in points)

Explanation: for food products, such as: fruits and vegetables N=172; meat, fishes, eggs, milk and dairy products N=136; frozen and deep-frozen products N=178, and medicinal products N=50.

Source: own research.

When evaluating the quality of logistic services in the scope of refrigerated transport, having taken into account the type of transported products, the respondents rated transport of medicinal products the highest (4.22 points) and so one may conjecture that they are content the most with the quality of logistic services related to the transport of such goods. According to the respondents, the second highest rating was deserved by transport of frozen and deep-frozen food products (about 3.9 points). In turn, according to company representatives (logistic purchasers) the average rating of the quality of logistic services in the field of transport of food products, such as fruits and vegetables, was 3.74 points. Yet, in the opinion of the study subjects the transport of food products, such as meat, fishes, eggs, milk and dairy products, was rated the lowest (3.52 points) which allows one to suspect that company representatives (service recipients) were glad the least about the quality of logistic services in transport of this group of products. It should be noted that when evaluating the quality of logistic services in the scope of transport of four groups of products, only transport of medicinal products was rated at above 4 points by the purchasers of logistic services, yet the other three groups of products were also highly rated given their average rates at above 3.5 points.

To find the distribution of the ratings of the quality level of logistic services in the scope of transport of four groups of products requiring controlled temperature, percentage indications of the company representatives’ (service purchasers) ratings were given. Fig. 3 presents the percentage indications given by the customers in terms of the evaluation of the quality level of logistic services in transport of food products, such as fruits and vegetables.

Fig. 3 Evaluation schedule level of quality logistic services in the field of food products transport, such as: fruits and vegetables (% of indications)

Source: own research.

It was shown that for almost 70% of the respondents the quality level of logistic services in the scope of transport of food products, such as fruits and vegetables, was high and very high. Based on that, one may suspect that for those purchasers of logistic services in transport of food products (fruits and vegetables) the level of quality during transport of this group of products is satisfactory. Yet, 22% of those questioned stated that the quality level of logistic services of transport of these products is average, and only 8% found it to be very low or low. High ratings of the quality level within the analysed group of transported products may come as a result of the fact that food products, such as fruits and vegetables, are among fragile goods and are characterized by numerous conditions in terms of their transport.
In turn, fig. 4 shows the percentage comparison of indications given by company representatives (service purchasers) as regards the evaluation of the quality level of provided logistic services in the scope of transport of food products, such as: meat, fishes, eggs, milk and dairy products.

![Fig. 4 Evaluation schedule level of quality logistic services in the field of food products transport, such as: meat, fishes, eggs, milk and dairy products (% of indications)](image)

Source: own research.

As a result of the conducted research, it should be noted that over 55% of the customers rated highly or very highly the quality level of logistic services in the scope of transport of food products (meat, fishes, eggs, milk and dairy products). Therefore, it is possible to conclude that for this group of the respondents the quality level of logistic services in the field of transport of food products, such as meat, fishes, eggs, milk and dairy products, was satisfactory. In turn, for over 25% of those questioned the quality of logistic services in the field of transport of the analysed group of food products was at an average level, and for nearly 20% of the respondents the quality level was low or very low.

The percentage comparison of customers indications regarding the ratings of the quality level of logistic services in terms of transport of frozen and deep-frozen food products is shown in fig. 5.

![Fig. 5 Evaluation schedule level of quality logistic services in the field of food frozen and deep-frozen products transport (% of indications)](image)

Source: own research.

As a result of the research, it was shown that for about 73% of the customers receiving logistic services in the scope of transport of frozen and deep-frozen food products the quality level of transported products is high or very high. On the other hand, about 20% of the respondents replied that the quality level of logistic services in the scope of the analysed group of food products is average. Transport of food products, including frozen and deep-frozen products, given health-related safety requirements, is restricted by many legal rules. The results of the research confirmed that, in the opinion of the customers, service providers pay much attention to following the compulsory requirements regarding temperature during transport of frozen and deep-frozen food products.

The service purchasers were also asked to evaluate the quality level of logistic services in transport of medicinal products. The percentage comparison of the received ratings is presented in fig. 6.

![Fig. 6. Evaluation schedule level of quality logistic services in the field of medicinal products (% of indications)](image)

Source: own research.
Taking into account the opinions of the respondents, it was shown that for as many as 80% of them the quality level of logistic services in transport of medicinal products is high or very high. Thus, one may suspect that for this group of the service purchasers the quality of logistic services in transport of medicinal products is highly satisfactory. In turn, 20% of the subject studies stated that for them the quality level of logistic services in transport of medicinal products is average, low or very low. Hence, this group of the respondents is probably the least satisfied with the quality of the provided logistic services in terms of transport of medicinal products given the ratings of some features of the service.

The influence of the ratings of the importance of the features of logistic services affecting the customer satisfaction on the evaluation of the quality level of logistic services in the scope of transport of food products, such as food products (fruits and vegetables), food products (meat, fishes, eggs, milk, dairy products) and frozen and deep-frozen food products, was analysed statistically. The value of the coefficient $p$ is the result of the Wilcoxon signed-rank test. The value of $p$ below 0.05 means the existence of a significant relation between the studied variables. The results are presented in table 1.

**Table 1** Dependence evaluation of quality logistic services in the field of transport various groups of food products on evaluation the importance of the features logistic services affecting the customer satisfaction

<table>
<thead>
<tr>
<th>Features logistic services</th>
<th>Food products (fruits, vegetables) N=172</th>
<th>Food products (meat, fishes, eggs, milk and dairy products) N=136</th>
<th>Food frozen and deep-frozen products N=178</th>
<th>Medicinal products</th>
</tr>
</thead>
<tbody>
<tr>
<td>Timeliness of deliveries</td>
<td>0.000000</td>
<td>0.000000</td>
<td>0.000000</td>
<td>0.016878</td>
</tr>
<tr>
<td>Completeness of deliveries</td>
<td>0.000000</td>
<td>0.000000</td>
<td>0.000000</td>
<td>0.140457</td>
</tr>
<tr>
<td>Promptness of deliveries</td>
<td>0.000000</td>
<td>0.000000</td>
<td>0.000005</td>
<td>0.190805</td>
</tr>
<tr>
<td>Accuracy invoiced</td>
<td>0.000061</td>
<td>0.000002</td>
<td>0.001482</td>
<td>0.939673</td>
</tr>
<tr>
<td>Faultlessness of deliveries</td>
<td>0.000000</td>
<td>0.000000</td>
<td>0.000000</td>
<td>0.138836</td>
</tr>
<tr>
<td>Flexibility of deliveries</td>
<td>0.000252</td>
<td>0.000009</td>
<td>0.010668</td>
<td>0.929730</td>
</tr>
<tr>
<td>Transportations conditions</td>
<td>0.002297</td>
<td>0.000228</td>
<td>0.050049</td>
<td>0.724285</td>
</tr>
<tr>
<td>Terminal conditions</td>
<td>0.215861</td>
<td>0.021727</td>
<td>0.964625</td>
<td>0.533674</td>
</tr>
<tr>
<td>Complexity of services</td>
<td>0.545712</td>
<td>0.048561</td>
<td>0.589352</td>
<td>0.070807</td>
</tr>
<tr>
<td>Meeting commitments</td>
<td>0.000000</td>
<td>0.000000</td>
<td>0.000074</td>
<td>0.492790</td>
</tr>
</tbody>
</table>

Source: own research.

It was shown that the rating of the quality level of logistic services in the scope of transport of food products (fruits and vegetables) is strongly affected by timeliness of deliveries, completeness of deliveries, promptness of deliveries, invoiced accuracy, faultlessness of deliveries, flexibility of deliveries, condition of means of transport and meeting commitments fully. It was found however that there was no statistical relation between the evaluation of the importance of the terminal's condition and the complexity of services and the evaluation of the quality level of logistic services in the case of the analysed group of products. When analysing the ratings of the quality level of logistic services in the scope of transport of food products, such as: meat, fishes, eggs, milk and dairy products, it was shown that all the features of a logistic service listed in table 1 affecting the customers satisfaction have a substantial influence on the rating of the quality level of logistic services of transport of this group of products. Moreover, it was shown that there was no relation between the importance of the condition of means of transport, condition of the terminal and the complexity of services and the rating of the quality level of logistic services in the scope of the transport of frozen and deep-frozen food products. Furthermore, the evaluations of the importance of timeliness of deliveries, completeness of deliveries, promptness of deliveries, invoiced accuracy, faultlessness of deliveries, flexibility of deliveries and meeting commitments fully have a significant influence on the rating of the quality level of logistic services in transport of frozen and deep-frozen food products.

The conducted statistical analysis revealed that only timeliness of deliveries has a significant influence on the evaluation of the quality level of logistic services provided in transport of medicinal products. The ratings of
the importance of the remaining features of a logistic service given in table 2 are not statistically significant when evaluating of the quality level of logistic services of transport of medicinal products. The revealed relation seems to be valid because in the opinion of company representatives (service purchasers) deliveries of medicinal products are expected to take place within the strictly specified time.

3. CONCLUSION
Making an attempt to evaluate the quality level of logistic services in the case of transport of four groups of carried products, it was shown that there was a very high level of general contentment with the quality of provided logistic services within refrigerated transport. Moreover, it was shown that the company representatives (service purchasers) rated the quality level of logistic services in the scope of transport of fresh food products as well as frozen and deep-frozen food products and medicinal products as satisfactory (about 4 points).

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REFERENCES