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THE ANALYSIS IN SOLVING THE PROBLEMS OF FORECASTING OF THE CONDITIONS OF CONSUMER GOODS TRANSPORTATIONS

Summary. There were determined parameters which will allow to develop the precise forecast of consumer goods transportations conditions and by means of which will be possible to decrease of transportations costs. This problem was solved by cluster analysis.

ANALIZA ROZWIĄZAŃ PROBLEMATYKI PROGNOZOWANIA WARUNKÓW TRANSPORTU DÓBR KONSUMPCYJNYCH

Streszczenie. Istnieją wskaźniki, które pozwalają na dokładne prognozowanie warunków transportu dóbr konsumpcyjnych, dzięki którym możliwe będzie obniżenie kosztów transportu. Problem ten został rozwiązany poprzez analizę klastrową.

1. INTODUCTION

At present, Ukrainian consumer market develops rather fast. The modern world crisis which has begun as crisis of steering by economy, has led to "freezing" of goods turnover of retails Thus, the majority of people became incapable of new purchases - from here, occurrences of sales crisis in the field of a retail network. Economists of the World bank confirm that Ukraine, one of few countries, has safely overcome a recent world economic crisis and begins development of retail trade. This tendency is especially apparent in big cities. According to the State statistics committee of Ukraine, the annual retail turnover has grown from 15% to 30% since 2002, the year when this process was identified.

The essential part of the total retail turnover (65%) accounts for cities. This process has two peculiarities: (1) fast expansion of assortment of commodities, and (2) reduction in load weight per a single dispatch. This process is also characterized by the toughening of requirements for delivery terms.

The most convenient and effective way to meet these requirements is to use automobile transport, which are characterized by high speed, mobility and versatility.

During the last years the retail in Ukrainian urban areas developed spontaneously, so did logistics schemes of consumer goods delivery. These schemes were oriented on current problems and did not take into account future trends. Engineers and logistics managers did not have sufficient data on transport working conditions and existent logistics networks and were not able to gain a clear understanding of trends in their development. So, classification of working conditions of highway motor carriers transferring consumer goods has now become an issue of the day in the Ukrainian transportation industry.

2. SURVEY OF LITERATURE ON THE SUBJECT

Rather big quantity of works of foreign and native explorers was dedicated to the survey of similar questions. Among the works of the last period the work [1], in which was explored the charge of the components of the material flow in the suply chains depending on different factors, including transportation was outstanding. It is determined that depending on the structure of suply chains, on the type of the goods, especially the price, the size of the flow of materials – unit weight of expenses transportation can reach 10-15% of general expenses for delivery.

However the conclusions given in the works mainly concern large companies which uses the supply channels exclusively and thus do all the logistic operations on cargo delivery. These conclusions cannot be applied on cargo delivery conditions of rather small trade enterprises. These are the ones that make the prevailing part of turnover of consumer market in Ukraine and use other enterprises for doing different logistic operations.

The work [2] is also given much attention on the influence of such indicators as dislocation density of consignee and the size of consignment on the expenses for the delivery. But the directions of the delivery process perfection are oriented on the concrete trade enterprise and need to be adjusted in every particular case. This doesn't give opportunity to determine the requirements to the truck fleet even in more or less big regions, and also to determine the change tendencies of transportation conditions as well as forecast these same requirements for the further period.

The work [3] is pointed to the necessity of taking into consideration the transportation conditions for cargo delivery system optimization notably logistic nets. This approach can be accepted only under condition that the structure which controls the system has the complete authority to fulfill this process. It is possible only in the network of a large company. Besides, the models applied in this work reflects the conditions of international cargo transportations and application of these for organizing transportation in the cities can lead to inadequate conclusions.

3. PROBLEM DEFINITION

On the basis of the purpose of the work, we have to determine the group of indicators of outer type, which characterize the transportation conditions and influence the economical indicators in the work of automobile transport when delivering consumer goods in the cities. Analysis of techno-economical models shows that such indicators are: the distance of cargo delivery, the size of consignment and, if the cargo delivery takes place on conveyance route – the mileage between delivery points of delivery on the route.

The size of the consignment can be determined through the volume and structure of turnover of retail outlet. The distance of cargo delivery is a personal behavior of every particular retail outlet because it depends on the positional relationship of outlet and its provider, the suply chain structure, which is accepted in one trade operator and can be widely changed within the same locality.

That is why this indicator cannot be chosen as the classification criteria of the transportation conditions. The last of determined parameters directly depends on the density of delivery points on the transportation area [2].

That is why it has to determined the groups of transportation conditions on criteria "dislocation density of retail outlets" and "average volume of turnover" for their further systematization for a purpose of precise determination of requirements truck fleet and the tendencies of their changes.

With this we need to minimize the quantity of clusters to prevent excess detailing and to determine the most general behavior of potential transportation areas and to provide the possibilities of rather precise forecast of the requirements to the truck fleet.

4. TASK SOLUTION

In order to develop such a classification, was explored the retail trade systems in 36 Ukrainian urban areas that have the population of over 100 000 citizens each. Information was collected on the number of retail outlets, restaurants, market places, and annual circulation of commodities in the retail sector. These data were analyzed with the help of the cluster analysis in order to identify clusters of cities with similar combinations of the numerical values of density of retail outlets dislocation and with similar annual volume of turnover for a single retail outlet. This data is presented in table 1.

According to the "Euclidian distance" criterion taking into account both indexes, the cities under analysis can be roughly arranged in six groups. On the fig. 1 is given graphical interpretation of the clusterization.
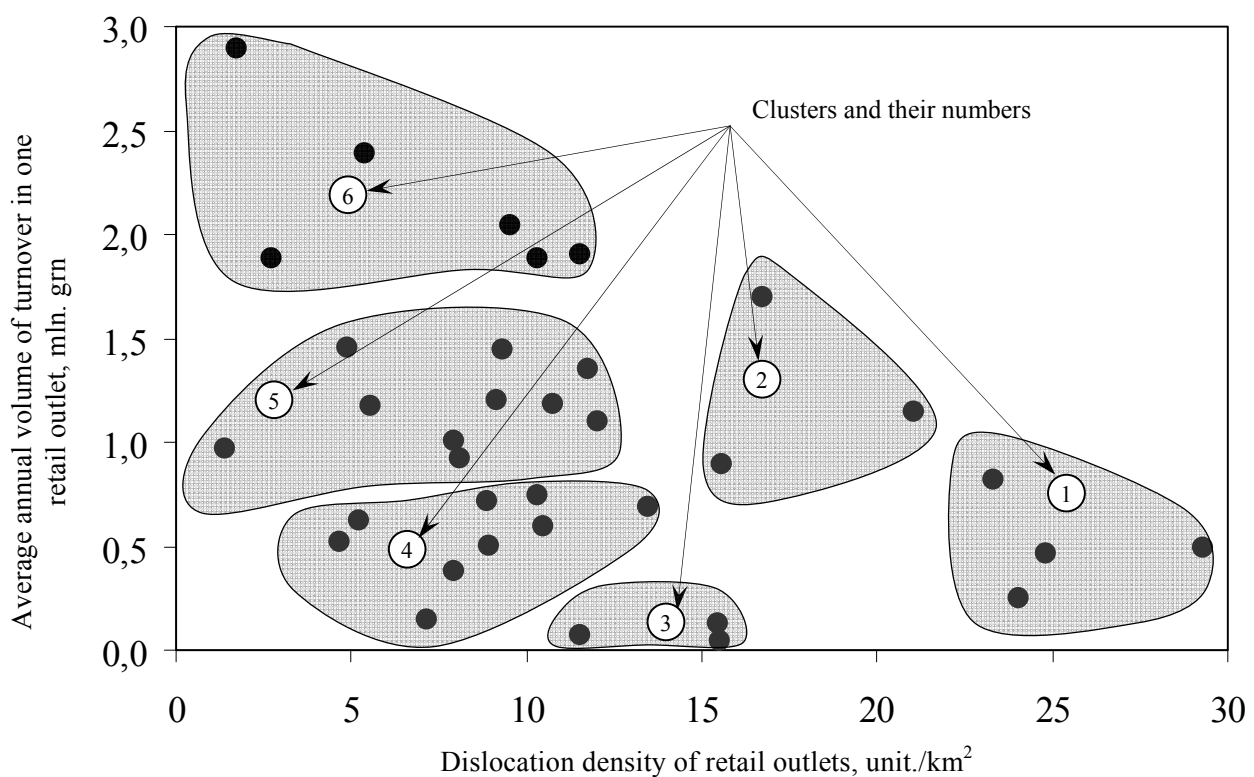

Fig. 1. Clusterization of cities
Rys. 1. Grupowanie miast

Among the peculiarities of the derived grouping should be noted such regularity: if the average value of the dislocation density of retail outlets from cluster to cluster decreases then the average annual turnover volume-except one, cluster 4 – increases.(see tab. 2)

The most significant index, which diversifies working conditions of transport in the sphere of retail trade, is the density of retail outlets dislocation. This index differentiates the clusters by one order of magnitude, whereas the indexes of annual turnover differ less than four times.

Table 1

Statistical data of the Ukrainian cities

City	Dislocation density of retail outlets, unit/km^2	Average annual volume of turnover in one outlet, mln. grn	City	Dislocation density of retail outlets, unit/km^2	Average annual volume of turnover in one outlet, mln. grn
1. Alchevsk	7,143	0,149	19. Lugansk	2,735	1,892
2. Berdyansk	15,430	0,135	20. Lutsk	9,500	2,049
3. Belaya Tserkov	15,502	0,047	21. Lviv	16,706	1,700
4. Vinnitsa	23,284	0,818	22. Makeevka	4,894	1,459
5. Gorlovka	5,517	1,182	23. Mariupol	11,730	1,359
6. Dnepropetrovsk	9,325	1,452	24. Melitopol	24,000	0,253
7. Donetsk	5,226	0,622	25. Poltava	10,485	0,597
8. Evpatoria	8,889	0,501	26. Sevastopol	7,895	0,384
9. Enakievo	8,846	0,723	27. Simferopol	29,283	0,499
10. Jitomir	12,031	1,099	28. Sumy	9,124	1,201
11. Zaporojie	7,940	1,012	29. Ternopil	11,500	1,911
12. Ivano-Frankovsk	13,453	0,691	30. Ujgorod	21,010	1,147
13. Kerch	4,624	0,528	31. Kharkiv	10,275	1,892
14. Kiev	5,371	2,392	32. Kherson	30,029	0,181
15. Kirovograd	1,718	2,898	33. Khmelnitski	15,557	0,897
16. Kramatorsk	8,060	0,926	34. Chernigiv	24,782	0,463
17. Kremenchug	10,271	0,743	35. Cherkassy	10,751	1,183
18. Lisichansk	1,391	0,970	36. Chernivtsi	11,533	0,072

For every cluster were calculated prognostic values of optimal carrying capacity of the cars in order to deliver the goods into retail trade net on [4] methodology. The calculations show that optimal carrying capacity can widely vary within one cluster as a result of wide variation of shipment average size. With this, for all the cities the optimal carrying capacity of the cars is 700-2500 kg.

Table 2

Characteristics of the city clusters

Cluster	Index of density of retail outlets dislocation, unit/km^2 (average values)	Index of annual turnover for a retail outlet (mln. hrv.) (average values)
1	25,398	0,560
2	15,330	0,694
3	11,072	1,107
4	8,525	0,933
5	5,126	1,237
6	1,948	1,920

So, this survey points to the fact that form the point of view of consumer goods transportation conditions, the cities of Ukraine can be divided into 6 groups. The difference between groups on single indexes is not univocal, but the complex consideration of two main factors which determine technological and economical indexes of transportation process allows to differ the groups from each other rather accurately. That is why the consideration of the offered classification of Ukrainian cities will allow to determine more thoroughly the quality and quantity characteristics of the truck fleet which is involved in transportation.

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