FORECASTING DEMAND IN THE LOGISTICS MARKET: A CASE STUDY OF LOGISTICS CENTER VRŠAC

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Abstract: This paper proposes a new methodological approach for estimation of demands and flows in the logistics market. Proposed approach is developed in a comprehensive way to better understand and evaluate perspective trends of logistics flows and demands for logistics services in conditions of great uncertainty, variability and unpredictability of geopolitical, economic, commercial, transport and traffic factors and opportunities in the logistics market. The procedure is applied in the concrete example for the forecasting of demands for logistics services and subsystems of future logistics center Vršac. In the case when there is a large variability in demand and when there are no obvious trends that can be applied in the future, the authors have decided to carry out the prediction of three possible scenarios for economic and social development. The goal was to develop approach that will use the larger field of possible future events on the logistics market.

Keywords: logistics market, logistics flows, demands, forecasting, logistics center

1. INTRODUCTION

The logistics market is defined as the place where flows of material and service products are created, realized and finished. The subjects of trade in these markets are material goods and logistics services related to the efficient flow of goods. The elements of commodity and transport flows are: generators of commodity flows - users (industry, trade, catering and craft enterprises, residents, economic and non-economic institutions and organizations, etc.); demand and market requirements for a particular structure and volume of material and service products (raw materials, intermediate goods, consumer goods, finished products, transport and logistics services, etc.); offer of the certain structure and volume of material goods, transport and logistics services for product delivery to the final consumers; carriers of the transport and logistics services, which are able to offer and provide specific services in the realization of cargo flows (transport companies, freight terminals and freight villages, shipping companies, logistics operators, service providers and others); places in which they carry out commodity flows and provide transport and logistics services (area, location, relations); time of the occurrence and realization of commodity flows, transportation and logistics demands associated with the flow and delivery of goods. (Kilibarda, 2011).

Logistics flows and requirements are extremely variable categories and sizes in terms of all parameters that characterize them. Markets, customers, place of origin and the end of the logistics flow are variable. Structure, volume and appearance of logistics demands are also

variable, as well as technology and carriers of logistics providers. Variability and instability of commodity flows is the result of a number of factors that directly affect the appearance and the flow dynamics and intensity. In situation of variability and unpredictability of geopolitical, economic, commercial, transport and traffic factors and opportunities in the logistics market it is very difficult to give a reliable assessment of the perspective trends of the logistics flows.

In contrast to all of these difficulties the successful development of logistics systems and the companies is not possible without forecasting and thinking about what will happen in the future (Leeuw et al. 1998). Logistics systems must analyze the future demands for services in more detail, and predict the relevant market, economic and logistics trends. However, because of the extreme specificity and complexity of relationships in the market, in the logistics literature and practice, there are no universal forecasting models and methods (Mcgivern, 2003; Mcneil, 2005). Also, standard methods and techniques often can not be directly applied. It is necessary to develop specific research and forecasting methodologies of logistics flows and demand which will include all relevant factors and possible scenarios of the development in accordance with the characteristics of specific markets and logistics systems. In this paper mentioned methodology is proposed, which was developed in order to assess the perspective trend of the logistics flows and demands for services and subsystems of logistics center.

2. METHODOLOGICAL APPROACH FOR LOGISTICS DEMAND FORECASTING

Bearing in mind all the problems, limitations, aggravating factors, as well as the importance of this problem, the authors have decided to develop and implement a complex methodological approach for forecasting. The process involves a series of interrelated and coordinated steps (figure 1): commodity flows market definition, the analysis of commodity flows characteristics, definition of development scenarios and factors, estimation of commodity flow perspective trend, commodity flow redistribution, logistics center and intermodal terminal Vršac demands determination.

In the catchment area of logistics center and intermodal terminal in Vršac, it is possible to extract the four typical types of markets: M1 - Vršac market which includes users of logistics services and commodity flow generators which are located in the municipality of Vršac. Economic entities are primarily located in the technology park and in the industrial zone, but also in the wide area of Vršac; M2 – Narrow catchment area include users who are spatially distributed in the South Banat and middle Banat District, and gravitate towards the logistics center and intermodal terminal Vršac; M3 – Wider catchment area includes all users of logistics services in the area of Vojvodina, Belgrade and Serbia, for which it is reasonably expected to be realized through the border crossing Vatin, and municipality of Vršac. Mainly it is import and export flows between certain areas of Serbia, on the one side, and Romania, Russia and eastern markets, on the other side; M4 – International market, which refers to customers who are on the territory of Romania and neighboring countries, with flows can reasonably be expected to serve logistics center and intermodal terminal Vršac subsystems. For defined markets economic and market potentials are perceived, characteristics of commodity flows, particularly in terms of realization over the logistics center. A detailed analysis of strategies and potential of economic development was made. Plans and business trends of economic development in are discussed. Relation between the development potential on the perspective trend of trade flows for different development scenarios are investigated.

For the described market, a detailed identification and quantification of import, export and transit commodity and transport flows is done. Trade flows were investigated and analyzed according to all relevant properties, such as: structure and intensity of flow, type and quantity of goods, direction and relations, etc. Commodity flows are investigated and analyzed for the period of 2005 - 2012. Commodity flows, current trends and future development plans, as well as the available logistical resources of the relevant business subjects in the catchment area are

identified and quantified through the survey and interviews. Specific requirements of the companies for logistics centre subsystems are determined.

Several factors which reflect market, business, economic, logistic and transport environment have strong influence on the appearance and realization of commodity flows in the region (Mentzer and Schroeter, 1997). In volatile and uncertain conditions that a longer period is characterized by commercial, economic, geopolitical and social trends in the region, it is difficult to reliably predict the effect of certain factors on the commodity flow trend. Due to the global economic crisis, the restructuring process, it is not possible identify clear trends that could be continued in the future. For these reasons, the research team decided to estimate certain trends in relation to the various scenarios of possible social and economic development.
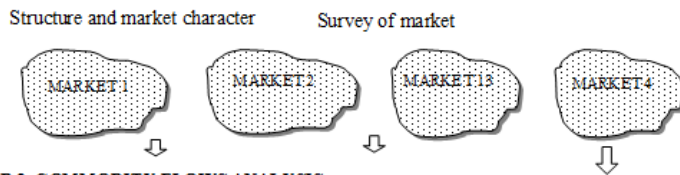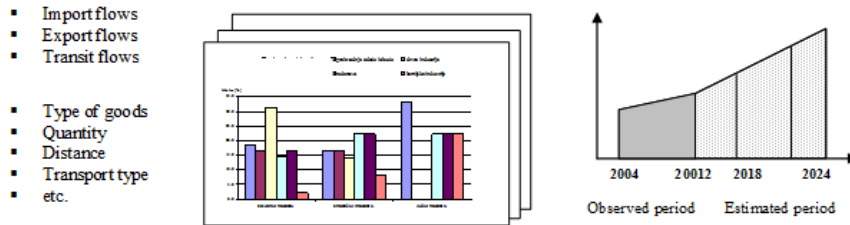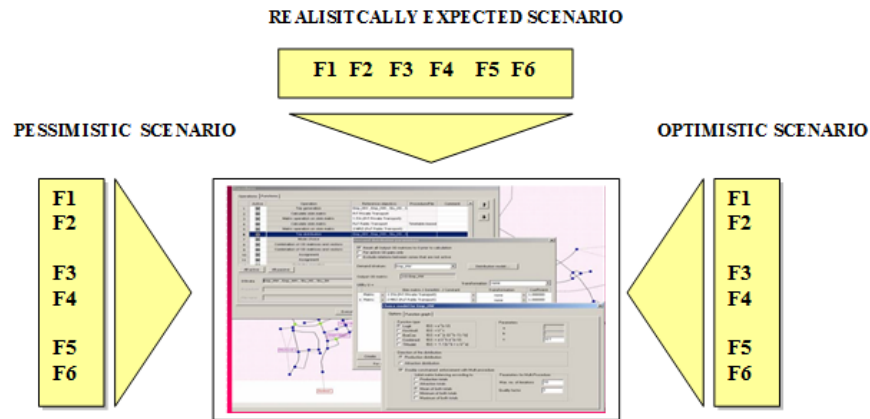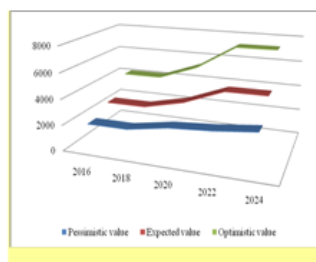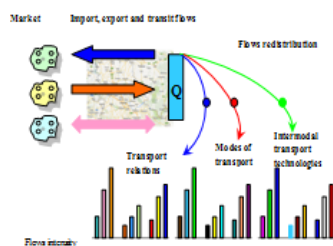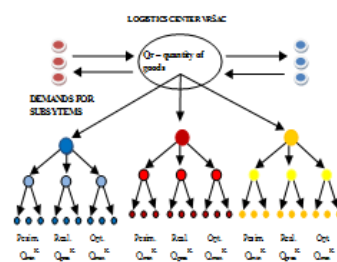

Figure 1. Procedure of estimation commodity and transport flow perspective trends

In order to cover as much of the possible future events, the three development scenarios are defined: basic (realistically expected), pessimistic and optimistic scenario. Five groups of factors are identified: F1 - structure and character of the market (from limited to expansive growth market), F2 – corporate and economic development (from slow to intense), F3 - political, market and economic integration (lack of market linkages to accelerated European integration), F4 - development of transport infrastructure (from underdeveloped and unrelated to the fully developed and associated transport and logistics network) and F5 - development of a logistics center with intermodal terminal (from slow to rapid construction and development). These factors have direct impact on the certain scenarios (table 1).

Table 1. Scenario and economic factor development

FACTORS	DEVELOPMENT SCENARIOS		
	Pessimistic	Basic (Real)	Optimistic
F1- structure and character of the market	Limited market	Medium expansion of the market	Expansive market growth
F2 – Economic development	Slow economic development	Rapid economic development	Intensive economic development
F3 – Market integration	Lack of market and economic integration	Regional market integration and connection with countries in region	Accelerated European integration
F4 – Transport infrastructure development	Low level of development of road transport infrastructure	Revitalization of road and rail infrastructure	Rapid construction and connection with European and Pan European transport network
F5 – Development of logistics center and intermodal terminal	Slow construction of logistics center and intermodal terminal and weakly attracting of commodity flows	Moderate development of the logistics center and intermodal terminal Vršac	Fast construction and development of the logistics center and intermodal terminal and strong attraction of commodity flows

Estimation of commodity flow perspective trend is realized in accordance with different flows categories, types of goods and different markets. In the logistics centre and intermodal terminal Vršac catchment area there are two types of commodity flows: flows with stable characteristics, which in the long run continuously appear with greater or smaller oscillations and flows with extremely variable characteristics, which in one period of time appear in a significant shape and intensity while in the next period almost did not appear.

In accordance with the above, expert estimations of commodity flow for period of next ten years are determined. Each estimation has a confidence interval in which can be found total commodity flow. For each assessment number of different options and corresponding probability of possible states are defined. The final assessment of the size of transport Q is a random variable, and it is defined for three defined scenarios. In this way, for commodity flow is obtained pessimistic, realistic and optimistic expected value. Perspective trends are estimated for all goods categories and all regions. Forecasted values for chemical products are shown in Figure 2, while forecasting values for South Banat region are presented in Figure 3.
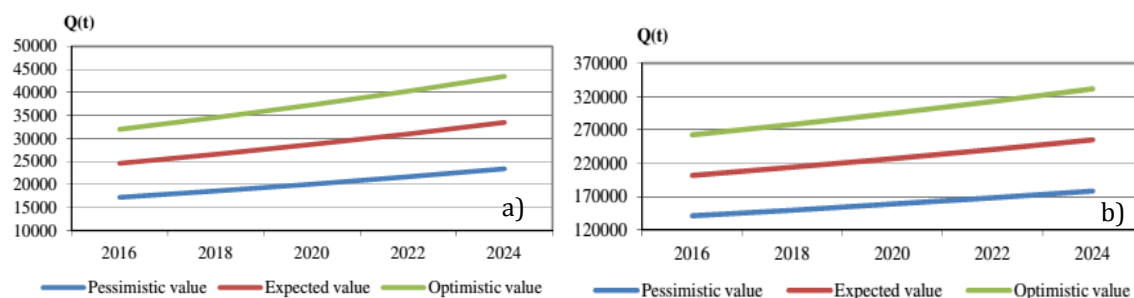

Figure 2. Perspective trends of commodity flows in narrow catchment area (a-import; b-export) – example of chemical products

It is realistic to expect that import flows of chemical products in narrow catchment in the beginning of the time horizon Serbia import 25000 t, while at the end of time horizon Serbia import 35000 t through narrow catchment area. In observed time horizon export flows will from 15000 t to 20000 t. Optimistic perspective trends for import and export flows in wider catchment area are 50000 t to 65000t for import and from 20000 t to 27000 t for export flows. Mention flows are very important for logistics center terminal operating.
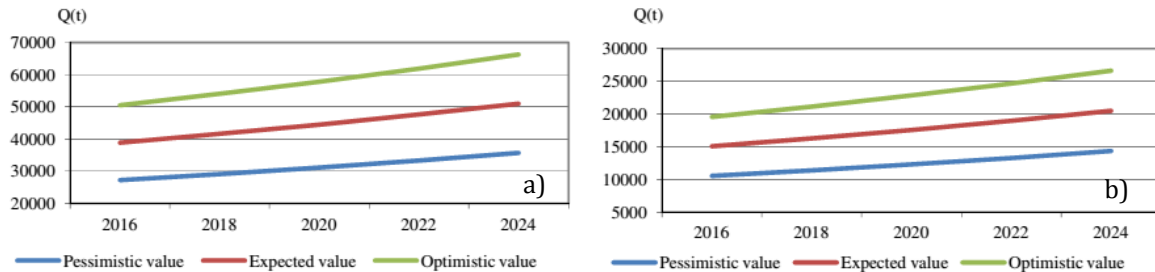

Figure 3. Perspective trends of commodity flows in wider catchment area (a-import; b-export) – example of South Banat region

After estimation commodity flow prospective trend redistribution of commodity flows on transport routes, modes of transport and intermodal transport technologies is done (figure 4). Redistribution is based on next factors: type and quantity of goods, transport distance, the advantages and shortcomings of certain types of transport, transportation resources and facilities, development of transport infrastructure, etc. Several criteria like transport time, transport costs, resources utilization, service quality and environmental criteria are used. In this paper two main redistribution categories are presented: according transport distances and according markets.
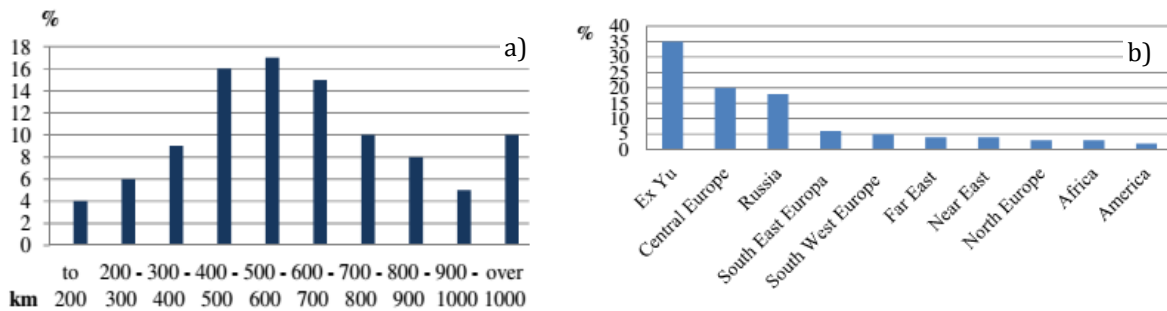

Figure 4: Commodity flow redistribution (a- according different transport distances; b-according markets)

For each flow from the previous step assessment of possible affiliation to logistics center is done. Affiliation was made on the basis of: categories and volume of commodity flow, goods types, the origin and the end of commodity flow, direction and distance, the location of the generator and connections of transport infrastructure with logistics center and intermodal terminal. As shown in table 2 four markets with different zones are analyzed: a zone of very high affiliation (the market of municipality of Vršac), zone of high affiliation (narrow catchment area), zone of medium affiliation (wider catchment area) and the zone of lower affiliation (international market).

The estimation took into account the position of the logistics center and intermodal terminal Vršac to competing centers and terminals in catchment area, such as Pančevo and Timisoara. For basic subsystems logistics center of Vršac estimation of demands volume with different probabilities that can be expected from the four types of market. The assessment was performed according to the possible development scenarios (pessimistic, expected, and optimistic). In this

paper warehouse and customs terminal are analyzed in more details. According table 2 it is easy to see that the most of the demands for customs and warehouse terminal are coming from Vršac market (M1) and narrow gravity area (M2).

Table 2. Estimation of demands for subsystems of logistics center (example of customs and warehouse terminal)

Markets (Pallets/year)	Customs terminal			Warehouse terminal		
	Pessimistic scenario	Basic scenario	Optimistic scenario	Pessimistic scenario	Basic scenario	Optimistic scenario
M1 - Vršac market	11960-17680	14040-9760	20800-26400	11900-15500	15300-18600	19100-23300
M2 - Narrow catchment area	11960-15600	14040-9760	16700-23200	12400-15500	13500-16700	15000-18100
M3 - Wider catchment area	6240-8320	10400-4040	12200-16500	3800-5600	5700-9200	14300-18000
M4 - International market	2600-3640	3640-4680	4300-5500	2500-4600	4100-6400	9200-11900
TOTAL	32760-45240	42120-8240	54000-71600	30600-41200	38600-50900	57600-71300

3. CONCLUSION

A new methodological approach for forecasting of demands and flows on the transport market is proposed in this paper. The main advantage of the proposed approach lies in the fact that approach includes all relevant factors of the marketing environment for the logistics market. Obtained results show great practical applicability of the model. Results also show that model has universal applicability for forecasting demands for services and subsystems of planned and projected logistics centers. The above-mentioned results represent a basis for further research towards the identification and quantification of requirements for the subsystems and structural elements of the logistics center, the determination of the corresponding values for dimensioning subsystem and determining expected revenues and evaluation of financial and economic feasibility of the project.

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