TANJA POLETAN JUGOVIĆ, D.Sc.
E-mail: poletan@pfri.hr
ALEN JUGOVIĆ, M.Sc.
E-mail: ajugovic@pfri.hr
University of Rijeka, Faculty of Maritime Studies
Studentska 2, HR-51000 Rijeka, Republic of Croatia
RATKO ZELENIKA, D.Sc.
E-mail: zelenika@efri.hr
University of Rijeka, Faculty of Economics
Ivana Filipovića 4, HR-51000 Rijeka, Republic of Croatia

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MULTICRITERIA OPTIMISATION IN LOGISTICS FORWARDER ACTIVITIES

ABSTRACT

Logistics forwarder, as organizer and planner of coordination and integration of all the transport and logistics chains elements, uses adequate ways and methods in the process of planning and decision-making. One of these methods, analysed in this paper, which could be used in optimisation of transport and logistics processes and activities of logistics forwarder, is the multicriteria optimisation method. Using that method, in this paper is suggested model of multicriteria optimisation of logistics forwarder activities. The suggested model of optimisation is justified in keeping with method principles of multicriteria optimization, which is included in operation research methods and it represents the process of multicriteria optimization of variants. Among many different processes of multicriteria optimization, PROMETHEE (Preference Ranking Organization Method for Enrichment Evaluations) and Promcalc & Gaia V. 3.2., computer program of multicriteria programming, which is based on the mentioned process, were used.

KEY WORDS

logistics forwarder, logistics chain, planning, multicriteria optimisation, PROMETHEE.

1. INTRODUCTION

The complexity of planning the logistics forwarder's activities in organising of the logistics chain indicates the need for appropriate methodology in order to simplify the procedure of planning.

According to the problem, subject and object of research in this paper, the scientific paradigm for setting the *basic hypotheses* was defined as follows:

Scientific cognitions about transport chains and networks, logistics chains and networks, as well as methods of multicriteria optimisation gives scientific preresquites for creating, designing, operating and controlling the optimal processes in logistics-forwarding industry.

The problem and subject of research respect *two related objects of research: the method of multicriteria optimisation and the logistics-forwarding industry.*

Regarding the mentioned problem, subject and objects of research, this paper analyzes the possibilities of implementation the multicriteria optimization model in activities of logistics forwarder related to the organisation and planning of the whole logistics-transport process as complex traffic phenomena. Using that method, this paper suggests a model of multicriteria optimisation of logistics forwarder activities, respecting the elements relevant for the organisation of logistics-transport process by logistics forwarder.

2. RELEVANT SPECIFICS OF LOGISTICS FORWARDING AND LOGISTICS FORWARDERS ACTIVITIES

2.1 Affirmation of logistics forwarding and logistics forwarder

Forwarding agents have shown and proven that international forwarding is an activity that has crucial relevance for supporting the production process as well as international business. Such claim has its scientific foundation, especially when the fact is kept in mind that only a little over 100 years ago everything that was produced was also consumed in the area not wider than 75 kilometres from the production place. Efficiency of such production and quality of life were at that time, at a relatively low level. At the end of the last two and a half decades, many changes have taken place concerning economic, political and other aspects that have significantly determined the freight forwarding development as well as other economic activities. Classic forwarding is becoming a thing of the past. New forwarding agents have expanded the forwarding services definition with coordination, organisation and execution of all the activities within forwarding system.

Concerning the development of forwarders' activities in supply and distribution, companies' networking, technological development, information technologies revolution, which all together represent the uprising of the networked community, new solutions and technologies as well as modern approach toward forwarding are necessary to create forwarding for the new millennium. Modern forwarding activities have enabled the growth process, economic development as well as selection of forwarders for the new millennium as a coordinator, integrator and supervisor of efficient logistics activities manager as well as respectable dominant architect of logistics system processes at domestic and international marketplaces of logistics services.

According to the above stated, it is evident that it is necessary to change the current practise of offering parts of services from numerous participants that has resulted in uncoordinated and "broken" logistics services such as transport, packing, warehousing (...) which have then resulted in delays and breaking time limits of deliveries as well as increasing stock quantities within the logistics system. Therefore, classic forwarders have to consider that the only way to stay and survive on the logistics and traffic marketplace is to grow, develop and profile into logistics forwarding operator which should be in the function of optimal connecting potential resources with suppliers and production centres with consumers.

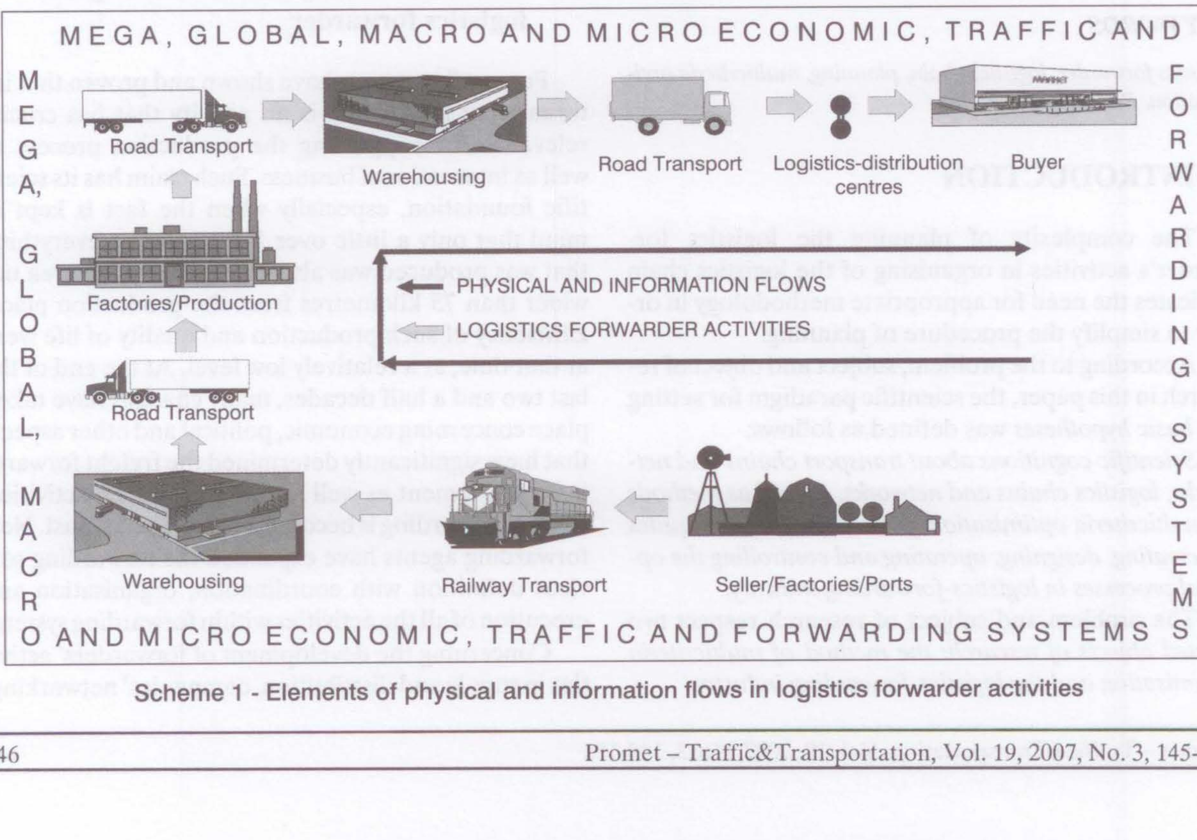
2.2 Logistics forwarder's activities

The survival of forwarding companies in competitive marketplace assumes significant expansion of supply of logistics-forwarding services including and offering the following: commodity warehousing, distribution, financial affairs concerning deliveries, all activities concerning internal logistics functions and such. When classic forwarding is compared with activities of logistics forwarding, one could determine with great safety that the latter is approximately 30% more complex, greater and more demanding than the classic forwarding activities (...). [1]

Logistics operators are oriented to global marketplace and create their own logistics systems where they, as active participants include only those harbours, shippers and inland transporters that can significantly contribute to the operators' business success and end users' needs satisfaction. To logistics operators the global business strategy is *conditio sine qua non* in the function of cost minimisation, effective logistics controlling and coordination advancement between different and numerous participants in global logistics chains. Globally oriented logistics operator aspires toward time, resources and logistics activities rationalisation. In respect to the above-stated the number of globally oriented logistics operators is getting bigger. These operators associate in order to create more efficient work at their target marketplaces and to broaden their abilities and become adaptable to rapidly changing business and market demands.

Therefore, the forwarder evolves into "Logistics operator as important factor of dynamisation of logistics processes and decrease of total logistics expenses".[2]

The trend of narrowing the total forwarding costs, to rationalise time and to achieve qualitatively integrated and coordinated forwarding service indicates the need of planning every segment in material and information flows in logistics chains. Some of the stated segments are illustrated in Scheme 1.



Scheme 1 - Elements of physical and information flows in logistics forwarder activities

To achieve the goal of quality services supply realisation of logistics forwarder, the planning of the entire logistics process anticipates in-depth analysis of all the segments and subjects in logistics chains, at the same time taking numerous different dimensions of supply criteria into consideration as well as their importance (priorities) in relation to interest, needs and preferences of end service users (forwarder's client)

The procedure of determining adequate solutions demands the perception of variant possibilities, solutions, as well as detail analysis and solution comparison with greater number of criteria.

Such analyses can be simplified by modern methods such as, for example, multiple criteria optimisation model. Even though this method as decision support system can be implemented in different areas, limited usage has been spotted in the area of traffic planning. Therefore, basic determinants of the method are being analysed as well as the option of its usage in activities of logistics forwarder.

3. CHARACTERISTICS OF MULTICRITERIA OPTIMIZATION

3.1 Methods of multicriteria optimisation

The goal of optimization is to choose the best option out of possible or favourable options in terms of accepted criteria. Such option is called the optimal variant and the optimal solution that is derived from compromise of goals and possibilities, goal achievement and limitations. [3]

The optimal choice of solution is a problem that becomes very complex if there are many criteria according to which the optimal solution is to be determined. Such problems can be solved by multicriteria optimization. [4]

The quality of procedure of choosing the best variant and accuracy of final decision will depend upon the quality of criteria determination and its measuring in respect to the optimization process. The variant generation analyzes all the possible solutions of the problem, selects reasonable set which represents the number of variants within which the final variant will be chosen from.

The decision maker has the crucial role in the procedure of multicriteria optimization model and quality variant definition. As legal entity or natural person responsible for decision-making and adoption of the final solution, the basic role that the decision maker plays is defining the preferences of criteria and structure as well as choosing and adopting the final solution. The complexity of the decision-making process lies in the preference structure of the decision maker that is based upon technical, technological, economical, social, political and other criteria that can be known prior to optimization or can be changed after completion of certain optimization processes.

The multicriteria ranking process is one of the many processes of multicriteria optimization method, that are used in the purpose of setting up the rank lists of variant solutions based upon the degree of defined criteria satisfaction. The purpose of variant ranking is to narrow the decision gap and to quantify the facts that are important for the decision-making process and for optimal variant choice from the set of variants that differ in dependence on the criteria adopted.

Multiple ranking procedures can be based upon the processes with in advance expressed preferences such as: PROMETHEE (Preference Ranking Organization Method), ELECTRE (Elimination and (et) Choice Translating Reality) and AHP (Analytic Hierarchy Process), processes for sets of non-inferior solutions like IKOR or other processes of multicriteria optimization for variant ranking: PROMETHEE, ELECTRE and AHP, where PROMETHEE and ELECTRE belong to "higher rank" processes and AHP to "priority" process.

3.2 PROMETHEE method

For the purpose of the research in this paper the PROMETHEE method and the computer program Promcalc & Giaia V. 3.2. (newer version - Decision Lab 2000 - for Windows) developed on the basis of the mentioned method were used. The main principles on which the "higher range" methods are based, such as PROMETHEE method, are: [5]

1) Extending of term "criterion"

Extending of the term "criterion" is based on the introduction of preference function, which gives the decision maker's preference for variant "a" compared to variant "b".

Preference function $P(a,b)$, from (a) to (b), is defined in the following way:

$$P(a,b)=\begin{cases} 0 & ;\ \text{if} \quad g(a)\leq g(b) \\ p[g(a),g(b)] & ;\ \text{if} \quad g(a)>g(b) \end{cases} \tag{1}$$

in concrete cases where it seems reasonable to choose the following type of p function:

$$p[g(a),g(b)]=p[g(a)-g(b)] \tag{2}$$

Depending on the difference between value $g(a)$ and $g(b)$.

To show the indifference area around $g(b)$, x is marked as:

$$x=g(a)-g(b) \tag{3}$$

and in graphical sense function $H(x)$ is defined as:

$$H(x)=\begin{cases} P(a,b) & x\geq 0 \\ P(b,a) & x\leq 0 \end{cases} \tag{4}$$

The preference function has to be defined for each criterion separately, and its value is from 0 to 1; lower value of preference function means higher indifference of decision maker and reverses if the value of preference function is closer to 1, then the preference is higher.

In case of strong preference, the function value equals zero. Most cases that appear in practice are covered with six function types: general criteria, quasi criteria, linear preference criteria and indifference area, Gauss criteria, where to make a decision, the decision-maker has to define two parameters at the most.

2) Estimation of "higher range" relation

Estimation of relation (graph) in "higher range" has to be made in the following way. For each $a, b \in A$ the preference index has to be defined for a in relation to b_i continuously for all the criteria. It is assumed that each criterion is identified as one of six possible types of criteria. Regarding this, the preference functions $P_i(a,b)$ are defined for each $i = 1,...,n$. The preference index is defined as follows:

$$\pi(a,b) = \frac{1}{n}\sum_{i=1}^{n} P_i(a,b). \qquad (5)$$

It is obvious that the mentioned index gives for all the criteria the preferential measure for a over b, like if index is closer to value 1 the preference is higher.

3) Using "higher range" relation

The above mentioned function usage allows the construction (use) of estimated relation (graph) of the "higher range", thus achieving partial (PROMETHEE I), that is, complete (PROMETHEE II) variant solutions ranking.

If estimated relation graph in higher range is defined, for each a, the output flow is:

$$\phi^+(a) = \sum_{x \in A} \pi(a,x), \qquad (6)$$

and the input flow is:

$$\phi^-(a) = \sum_{x \in A} \pi(x,a). \qquad (7)$$

If the decision maker needs complete ranking *(PROMETHEE II)*, without incomparability, which means ranking variant where each variant has its own rank and there is no possibility that two or more variants are in the same rank, then for each solution $a \in A$ the clear flow is analysed:

$$\phi(a) = \phi^+(a) - \phi^-(a) \qquad (8)$$

which could be easily used in solutions ranking:

- a has a higher rank compared to b $(aP^{(2)}b)$ if $\phi(a) > \phi(b)$
- a is indifferent to $b(aI^{(2)}b)$ *if* $\phi(a) = \phi(b)$. (9)

Computer software PROMCALC & GIAIA V. 3.2. for MS DOS was used for the processing of data for the simulation model.

4. MULTICRITERIA OPTIMIZATION MODEL IN LOGISTICS FORWARDER ACTIVITIES

According to the basic multicriteria variant ranking procedure, for this optimisation model for logistics forwarder activities and with input of data into computer program used, variants, criteria, combinations, criteria complexity (criterion significance from consumer's aspect) and optimal criteria size (minimum or maximum criteria value) had to be determined. The criteria evaluation was then conducted for all the chosen variations. All the above stated data have been input into the computer software which resulted in multicriteria optimization.

4.1 Multicriteria optimization based on PROMETHEE II method

Before implementation of the multicriteria optimisation, on the basis of all the possible problem solutions analysis, the adequate number of variants has to be selected. Within these variants, the final (optimal) variant will be defined. With preliminary variant (traffic routes) selection, the elimination of variants which are not appropriate according to conditions important for final choice of the variant is achieved.

Variants that have been taken into consideration in this research are shown in Table 1, and relate to traffic routes from Rijeka, Koper and Trieste that represents the reference points of every traffic route to its destination – the capitals of the Central European transit countries (Austria, Czech Republic, Slovakia and Hungary).

One of the important tasks of logistics operator is to define the optimal variant of traffic route and to choose the optimal logistics chain elements including users' interests (lower price with higher quality of logistics-transport service).

Besides the selected ports and destinations on the selected traffic routes (variants), of great importance for logistics chain organisation and optimisation are the transit points, such as: warehouses, road terminals, railway terminals, distribution centres, (...). These points significantly determine the service price and quality, and therefore have to be analysed and taken into consideration from the aspects of selected economic and quality criteria.

Variants of traffic routes are divided into four groups (A, B, C and D) and competitive analysis will be conducted for each variant group in order to deter-

Table1 - Variants of traffic routes

Variants		Transit points / Traffic routes
A	A1:	P/A1-W/A1-RT/A1-RWT/A1-DC/A1 – DP1
	A2:	P/A2-W/A2-RT/A2-RWT/A2-DC/A2 – DP1
	A3:	P/A3-W/A3-RT/A3-RWT/A3-DC/A3 – DP1
B	B1:	P/B1-W/B1-RT/B1-RWT/B1-DC/B1 – DP2
	B2:	P/B2-W/B2-RT/B2-RWT/B2-DC/B2 – DP2
	B3:	P/B3-W/B3-RT/B3-RWT/B3-DC/B3 – DP2
C	C1:	P/C1-W/C1-RT/C1-RWT/C1-DC/C1 – DP2
	C2:	P/C2-W/C2-RT/C2-RWT/C2-DC/C2 – DP2
	C3:	P/C3-W/C3-RT/C3-RWT/C3-DC/C3 – DP2
D	D1:	P/D1-W/D1-RT/D1-RWT/D1-DC/D1 – DP3
	D2:	P/D2-W/D2-RT/D2-RWT/D2-DC/D2 – DP3
	D3:	P/D3-W/D3-RT/D3-RWT/D3-DC/D3 – DP3

* P-port (P1-Rijeka, P2-Kopar, P3-Trieste), W-warehouse, RT-road terminal, RWT- railway terminal, DC-distribution centre, DP-destination (DP1-Vienna, DP2-Bratislava, DP3- Prague, DP4-Budapest)

mine the optimal traffic route and transit points for certain destination points in Central Europe.

Multicriteria analysis of generated variations was conducted for three cases:

- 1st case: Road traffic variant,
- 2nd case: Railway traffic variant, and
- 3rd case: Road or railway corridor variant.

Cases defined by certain difficulty level criteria combinations that are to be taken into consideration were also analyzed. For example, in 1st case, the criteria applied to the analyzed ports and road traffic corridors will hold certain weight assigned to them, while the criteria related to railroad corridor the criteria difficulty will equal zero. Pursuant to the above stated, appropriate difficulty value combinations were set and entered into software for other two cases. This paper considers the *Quality-Price-Ratio*[6] as the criterion of traffic route competitiveness. Therefore, the defined criteria subject to evaluation are: economic criteria (C11.1 – C 13.2) and qualitative criteria (C24.1 – C26.1), which are shown in Table 2.

The basic part of research plan and one of the prerequisites for multicriteria model analysis is determining the combination of selected criteria, criteria difficulty and criteria function, which changes of criteria affect the optimal solution selection (variant is visible). Criteria difficulty was the significance of certain criteria of the multicriteria method evaluated: difficulty 0 – criteria are taken into consideration; difficulty 1- low criteria difficulty; difficulty 2 – medium criteria difficulty; difficulty 3 – high criteria difficulty.

The selected criteria are estimated simultaneously for all the defined variants (Table 3) and represent the basic input data of multicriteria analysis and software for multicriteria programming.

Depending upon the criteria type, certain criteria were assessed based on the concrete (exact) data, and some based upon subjective assessment but with argument for grades assigned to it. Such comparison possibility of differently dimensioned criteria is also one of the advantages of multicriteria optimization model.

According to the basic PROMETHEE principles, all valuation criteria were defined as Type 1 (general criteria) – criteria that do not require additional parameters for preference function specification.

4.2 Multicriteria optimization model results

According to the goal of this research, ranking of variants based upon selected criteria represents the main output data by which the decision maker or logistics forwarder can make significant decisions regarding optimisation of the logistics-transport process analysis. The value ranking has been conducted in regard to:

- economic criteria influence,
- quantitative criteria influence, and
- combination of the above stated criteria influence.

In the variant ranking, the rank number equals the number of variants. According to that, this research, where the total variant number is 3 (per group), ranks from 1 to 3 are possible, where at rank I. the variant is the best one (optimal) to certain criteria, rank III. – less favourable variant with regard to the other two. Multicriteria optimization method results (ranks) where variants of traffic corridors are shown are visible in Table 4 which shows the variant ranking, separate for economic criteria and for qualitative criteria, and according to the simultaneous influence of economic and quantitative criteria.

Table 2 - Criteria, types, measurement scale and importance (weight)

	Criteria	Type	Measurement Scale	Weight
C11.1	Light Dues	Min	Eur	0
C11.2	Port Dues	Min	Eur	1
C11.3	Pilotage	Min	Eur	1
C11.4	Mooring / Unmooring	Min	Eur	1
C11.5	Customs duties	Min	Eur	0
C11.6	Agency Fee	Min	Eur	1
C11.7	Garbage Removal	Min	Eur	0
C11.8	Towage	Min	Eur	1
C11.9	Other	Min	Eur	3
C11.10	Total costs / Ship	Min	Eur	3
C12.1	Unloading (Ship – terminal)	Min	Eur/20'TEU	2
C12.2	Loading (terminal - vehicle)	Min	Eur/20'TEU	2
C12.3	Total costs / Cargo	Min	Eur/20'TEU	3
C13.1	Price of road transport	Min	Eur/20'TEU	3
C13.2	Price of railway transport	Min	Eur/20'TEU	3
C13.1	Port Dues + Price of road transport	Min	Eur/20'TEU	3
C13.2	Port Dues + Price of railway transport	Min	Eur/20'TEU	3
C24.1	Shipping lines (number of shippers)	Max	number	0
C24.2	Railway lines (container block trains)	Max	Subjective (1-3)	2
C25.1	Port capacities	Max	Subjective (1-3)	2
C25.2	Road transport (organisation road forwarding)	Max	Subjective (1-3)	1
C25.3	Railway transport (organisation of railway forwarding)	Max	Subjective (1-3)	1
C25.4	Road capacities	Max	Subjective (1-3)	2
C25.5	Railway capacities	Max	Subjective (1-3)	2
C26.1	IT implementation in ports	Max	Subjective (1-3)	3
...	...			

Source: Results from data processing with program PROMCALC & GIAIA V. 3.2. - PROMETHEE II

Results obtained with multicriteria optimization models may be used as the background for the decision-making of optimal variant of logistics chain. For example, when decision has to be brought regarding which result (variant) is optimal, the best variant is the one ranking first, and the worst is the one ranking last. Prerequisite for this is to define mutual difficulty criteria ratios. For example, in case of economic and qualitative criteria of logistics service and combined road--rail transport, optimal variants in logistic chains are transport routes: A2, B2, C3 and D3 (Table 1).

With multicriteria optimization model results, it can be concluded which transport routes is more competitive according to the alternative routes in regard to selected economic and qualitative criteria. In accordance to the above stated, logistics forwarder should be in the function of optimal integration and coordination of logistics-transport process, taking into consideration, first of all the users' interests and preferences.

Detailed analysis provides much more precise conclusions. However, with detailed variant analysis, assuming the result tracking with different criteria significance, it is possible to specify those criteria that are currently responsible for the optimal variant.

5. CONCLUSION

By elaborating theoretical determinates of multicriteria optimisation methods and by defining the concrete multicriteria optimisation model for optimising the logistics forwarder's activities, this paper shows the basic, remarkable possibilities of the mentioned

Table 3 - Evaluation matrix

	Criteria	C11.1	C11.2	C11.3	C11.4	C12.1	C12.2	C13.1	C13.2	C24.1	C24.2	C25.4
		Min	Min	Min	Min	Min	Min	Min	Min	Max	Max	Max
	Type	1	1	1	1	1	1	1	1	1	1	1
	q	-	-	-	-	-	-	-	-	-	-	-
	p	-	-	-	-	-	-	-	-	-	-	-
	Weight	0	1	1	1	2	2	3	3	0	2	2
Variants	A1	1206	2460	144	169	902	47,57	845,6	718,6	17	1	1
	A2	445	2586	197	193	931	50,00	750	574	24	5	2
	A3	952	68	285	164	1706	97,00	892	525	25	12	2
	B1	1206	2460	144	169	902	47,57	945,6	483,6	17	1	1
	B2	445	2586	197	193	931	50,00	850	515	24	5	2
	B3	952	68	285	164	1706	97,00	942	677	25	12	2
	A1	1206	2460	144	169	902	47,57	1245,6	744,6	17	1	1
	A2	445	2586	197	193	931	50,00	1150	778	24	5	2
	A3	952	68	285	164	1706	97,00	1292	841	25	12	2
	A1	1206	2460	144	169	902	47,57	895,6	454,6	17	1	1
	A2	445	2586	197	193	931	50,00	850	506	24	5	2
	A3	952	68	285	164	1706	97,00	1042	680	25	12	2

Source: Results from data processing using program PROMCALC & GIAIA V. 3.2. - PROMETHEE II

Table 4 - Variant ranking list - PROMETHEE II

Criteria		Economic			Quality			Economic & Quality		
		Road	Rail	Road&Rail	Road	Rail	Road&Rail	Road	Rail	Road&Rail
RANK	I.	A2	A3	A2	A3	A2	A3	A2	A3	A2
	II.	A1	A2	A3	A2	A3	A2	A3	A2	A3
	III.	A3	A1	A1	A1	A1	A1	A1	A1	A1
RANK	I.	B2	B1	B2	B3	B3	B3	B3	B2	B2
	II.	B3	B2	B1	B2	B2	B2	B2	B3	B3
	III.	B1	B3	B3	B1	B1	B1	B1	B1	B1
RANK	I.	C2	C1	C2	C3	C3	C3	C3	C3	C3
	II.	C1	C2	C1	C2	C2	C2	C2	C2	C2
	III.	C3	C3	C3	C1	C1	C1	C1	C1	C1
RANK	I.	D2	D1	D2	D3	D3	D3	D3	D3	D3
	II.	D1	D2	D1	D2	D2	D2	D2	D2	D2
	III.	D3	D3	D3	D1	D1	D1	D1	D1	D1

Source: Results from data processing using program PROMCALC & GIAIA V. 3.2. - PROMETHEE II

method for the purpose of decision processes in traffic planning. All that is mentioned shows the complexity of decisions which the logistics forwarder has to define as a person responsible for the mentioned logistics chain optimisation. In other words, this means the analysis of all the existing variants of the logistics-transport service (transport routes, transit points, ...) with an all-inclusive evaluation of the selected economic and qualitative criteria relevant for the logistics-transport service competitiveness.

One of the modern methods that at the same time take the analysis of different criteria into account is the multicriteria optimization. Although the above stated method, as support in decision-making can be applied in several areas, the limitations have been spotted while using it for traffic planning.

The suggested model is justified in keeping with the method principles of multicriteria optimization, which is included in the operation research methods. Among many different processes of multicriteria optimization, as illustrative example for the model implementation of the multicriteria optimisation in activities of logistics forwarder, in this paper were used PROMETHEE (Preference Ranking Organization Method for Enrichment Evaluations) and computer program of multicriteria programming which is based on the mentioned process - Promcalc & Gaia V. 3. 2.

On the basis of the method theoretical determinates variants of logistics chain (alternative variants of transport, transport technology, warehouses, transport terminals, distribution centres, ...), criteria (economic, qualitative, ...), weight (importance) of criteria and user's preferences have been defined and put into effect. On the basis of these data evaluation of selected criteria and multicriteria optimisation of the analysed variants have been made. In keeping with the primary goal of the research, the received results give conclusions about optimal variant of logistics-transport service with regard to the alternative variants, despising among many analyzed economic and qualitative criteria those criteria which are of great importance for the users of logistics-transport service.

Besides a concrete problem being applied, the value of the suggested model is also visible in the methodology offered. The specific methodology applied is multicriteria analysis that has in this paper been only partially shown. The multicriteria analysis model applied in optimising the logistics-transport process is possible to prefect having the complexity of logistics forwarder activities in logistics chain in mind. In other words, this means taking into consideration all the economic and quality criteria which have influence on the instradation as choice of optimal transport route, transport technology transport means, cargo terminals, distribution channels and other elements of logistic chain, as well as taking into consideration all the possible combination of criteria weight (importance).

Dr. sc. **TANJA POLETAN JUGOVIĆ**
E-mail: poletan@pfri.hr
Mr. sc. **ALEN JUGOVIĆ**
E-mail: ajugovic@pfri. hr
Sveučilište u Rijeci, Pomorski fakultet
Studentska 2, 51000 Rijeka, Republika Hrvatska
Dr. sc. **RATKO ZELENIKA**
E-mail: zelenika@efri. hr
Sveučilište u Rijeci, Ekonomski fakultet
Ivana Filipovića 4, 51000 Rijeka, Republika Hrvatska

SAŽETAK

VIŠEKRITERIJSKA OPTIMIZACIJA U DJELATNOSTI LOGISTIČKOGA ŠPEDITERA

Logistički špediter, kao glavni organizator i planer koordiniranosti i integriranosti svih elemenata unutar transportnih i logističkih procesa koristi primjerene načine i metode planiranja i odlučivanja. Jedna od metoda koja može naći svoju primjenu u optimizaciji predmetnih transportnih logističkih procesa i djelatnosti logističkih špeditera, a koja je analizirana u ovoj raspravi je metoda višekriterijske optimizacije. Korištenjem te metode u ovoj raspravi je predložen model višekriterijske optimizacije aktivnosti logističkoga špeditera. Predloženi model osmišljen je u skladu s temeljnim principima metode višekriterijske optimizacije, koja spada u metode operacijskih istraživanja, a predstavlja postupak višekriterijskog rangiranja varijanti. Između više različitih postupaka višekriterijske optimizacije, korišten je postupak PROMETHEE (Preference Ranking Organization Method for Enrichment Evaluations) te računalni program višekriterijskog programiranja Promcalc & Gaia V. 3.2., koji se temelji na navedenom postupku.

KLJUČNE RIJEČI

logistički špediter, logistički lanac, planiranje, višekriterijska optimizacija, PROMETHEE

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