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NETWORK MODELING OF CARGO TRANSPORTATION ON OPEN ROLLING STOCK

Daurerbek Ilesaliev Ixtiyarovich
Doctor of Sciences, Professor, Department of "Cargo Transportation Systems" Tashkent State Transport University. 1 Temiryulchilar St., Tashkent, Uzbekistan, 100069

Jamol Shihnazarov Alisherovich
Assistant Department of "Cargo Transportation Systems" Tashkent State Transport University. 1 Temiryulchilar St., Tashkent, Uzbekistan, 100069
Author Emails: Corresponding author: jamol.alisherovich@mail.ru

Dehqonov Mirali Mirxon o'g'li
Assistant Department of "Cargo Transportation Systems" Tashkent State Transport University. 1 Temiryulchilar St., Tashkent, Uzbekistan, 100069

Ikramova Diyoraxon Zakirjon qizi
Assistant Department of "Cargo Transportation Systems" Tashkent State Transport University. 1 Temiryulchilar St., Tashkent, Uzbekistan, 100069

Abduraximov Ozodbek O'tkir o'g'li
Assistant Department of "Cargo Transportation Systems" Tashkent State Transport University. 1 Temiryulchilar St., Tashkent, Uzbekistan, 100069

Annotation
New effective methods of planning and managing transportation are network planning and management. Network planning and management is a set of methods that can be used to model technological processes in the operation of various industries. In order to develop an action plan for the implementation of technological processes for the transportation of goods in transport, it is important to describe it using a network model[1].

Keywords: Wagon, network model, transportation, intermodal transportation, fasteningeconomic performance, impact forces, open movement structure.

Introduction

The transport process is checked from the intermodal transport unit. The definition of each operation traded in transport facilities is given in the first table by changing **A $_{i}$ (1-8)** . In the same series of marketable operators, the relative interdependence $K^{*}=0$ is accepted. In the case of a series of operations, the load is taken on the basis of the sum of the total time of the operations performed in the warehouse.

Table 1.1 Cargo operations performed in the consignor's warehouse

№	Work	Members	Job definition	Previous work	Work duration parameters, minutes				Dispersion
					t_{ij}^{min}	t_{ij}^{nv}	t_{ij}^{max}	t_{ij}	σ_{ij}^{2}
1	Acceptance of vehicles	The sender	A_1	-	4	7	on	7	1.00
2	Preparation of cargo for loading	The sender	A_2	A_1	10	12	1 5	12	
3	Payment for transportation from the consignor's warehouse to the logistics terminal	Sender, operator	A_3	A_1	15	22	25	21	2.77
4	Loading in IT	Carrier, crane operator	A_4	A_2, A_3	24	30	36	30	4.00
5	Load protection in IT	Cargo delivery workers	A_5	A_4	36	40	54	42	9.00
6	ITE road transport is loading	Truck driver, crane operator	A_6	A_5	12	15	25	15	4.69
7	Preparation of cargo for shipment	Intermodal transport operators	A_7	A_6	5	7	9	7	0.44
8	Departure	Intermodal transport operators	A_8	A_7	2	3	5	3	0.25

Methods

Strict attention is paid to the sequence of technologists performed at the transport facilities during the transportation process. This is because there are operations that must be pre-empted when interconnected operations are performed[2-3]. Table 1.1 shows the contents of the market of operators traded in the consignor's warehouse. An input algorithm aimed at identifying and optimizing co-marketed operations in the implementation of technological processes in warehouses:

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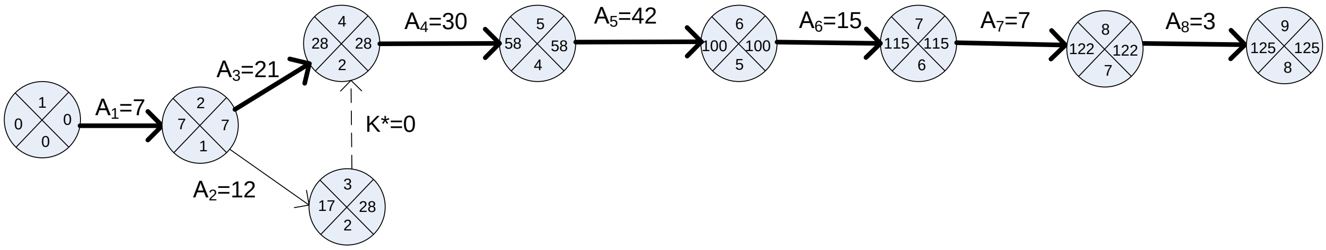

By constructing a network model of marketing operations in the consignor's warehouse, a critical path of the process has been identified. Operations that can and cannot be interrupted by the process path in the transport object are represented by single network models. The critical path of Zharayon is through kalik lines. Critical path changes in the overall timing of the implementation of the process if the market timing of the operations is delayed.

The sum of the total time of operations performed in the consignor's warehouse in the case of a series of operations:

$$\sum_{i=1}^{n} A\,i = A1 + A2 + A3 + A4 + A5 + A6 + A7 + A8$$

$$\sum_{i=1}^{n} A\,i = 7 + 12 + 21 + 30 + 42 + 15 + 7 + 3 = 137\ minutes$$

formed.

And A_j (1-8) is an operation - a sequence of operations to drop marketers. It is built with a general continuation of the work process in the case where the operation of the production network models.

The sum of the total time spent in the implementation of the combination of time spent network models and the logical dependence of the operation performed on the warehouse of the sender on the basis of which the calculation algorithm is based on it:

$$\sum_{j=1}^{n} A\,j = A1 + A3 + A4 + A5 + A6 + A7 + A8$$

$$\sum_{j=1}^{n} A\,j = 7 + 21 + 30 + 42 + 15 + 7 + 3 = 125\ minutes$$

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forms
$\sum_{i=1}^{n} \boldsymbol{A\,i} - \sum_{j=1}^{n} \boldsymbol{A\,j} = \mathbf{12}$ minutes or 9% ha by building network models and algorithms in the warehouse of the freight forwarder .
To date, one of the objects of login transport to participate in the supply chain is a suspicious terminal. Because one of the main manufacturers of logistics terminals considered the transfer of goods from one mode of transport to another. The importance of logistics terminals in the transportation of goods from one mode of transport to another is high[4].
The object of transport carries out the identification of each of the markets . In the case of serial marketing operations, logistics is performed at the terminal.
1.2zhadval for the logical sequence of operations performed on logistics terminals.

Table 1.2 Cargo operations performed within the logistics terminal

№	Performance	Members	Job definition	Previous work	Work duration parameters , min				Dispersion
					t_{ij}^{min}	t_{ij}^{nv}	t_{ij}^{max}	t_{ij}	σ_{ij}^{2}
1	Acceptance of vehicles in LT	operator	B1 _	-	5	6	9	6	0.44 _
2	Unloading IGE _	Warehouse worker	B2 _	B1	25	30	45	32	11.11
3	Storage of IGE	Warehouse worker	B3 _	B2	60	85	115	86	100
4	Agreement between the sender and the railway	Operator, railway transport	B4 _	B2	8	10	15	11	1.30
5	Shipping plan	Operator, railway transport	B5 _	B2	50	65	80	65	25.00
6	Application for wagon	Operator, railway transport	B6 _	B2, B4	7	10	15	10	1.55
7	Payment for transactions within the terminal	Operator,	B7 _	B5, B6	7	8	11	8	4.00
8	Payment for freight from the station desp . to the station _	Operator, translator	B8 _	B7	8	15	30	16	13.44
9	The consignor's notice of delivery of the wagon	Operator, sender	B9 _	B7 _	2	3	5	3	0.25
10	Delivery of railway wagons for loading	Operator, sender	B10 _	B7 _	30	40	50	40	11.11
11	Preparation To download IGE	operator	B 11	B10 _	8	10	10	10	1.00
12	Customs operations	Operator , customs officer	B12 _	B10 _	205	2 65	325	265	400
13	Execution of transport documents	Railway workers	B 13	B 11	30	40	15	40	11.11
fourteen	IGE to the installation platform	Railway workers	B 14	B 13	15	20	25	20	2.77
fifteen	Fill (if necessary)	Railway workers	B15 _	B 14	5	7	9	7	0.44
16	Preparation of cargo for shipment	Railway workers	B 16	B 14	8	9	11	9	0.25
17	Departure	Railway workers	B17 _ _	B 16	1	1	2	1	0.03

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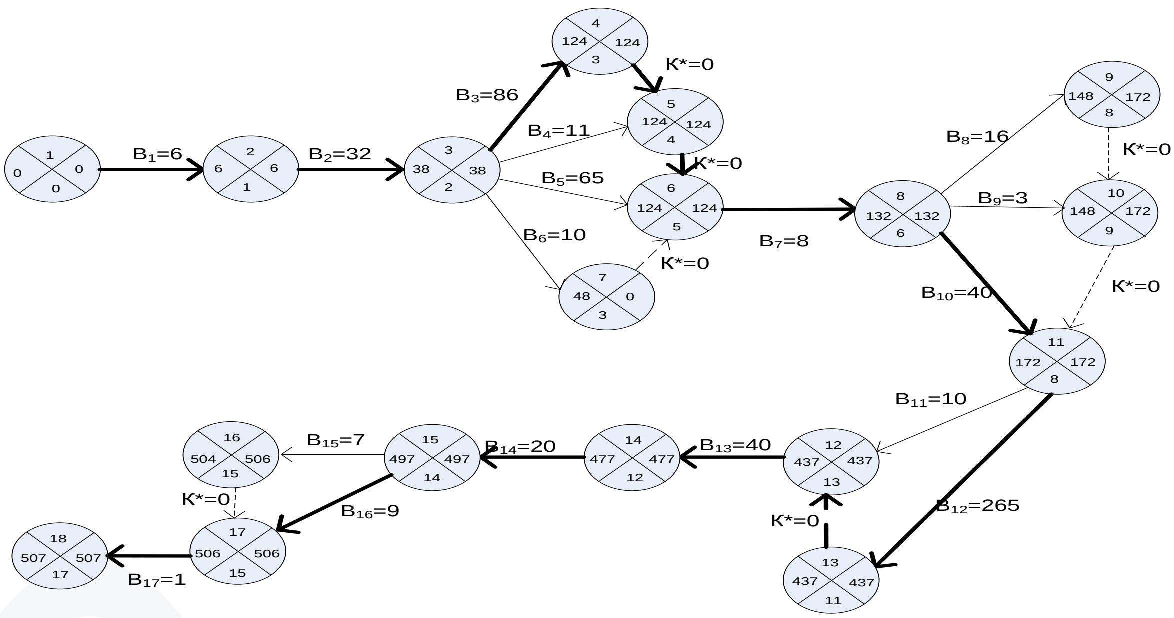
Table 1.2 is a network marketing model of the logistics terminal, which is directly involved in the chain of options, taking into account the interdependence of options in the organization of the logistics terminal.



The sum of the total time of operations performed at the logistics terminal in the case of serial marketing of operations:

$$\sum_{i=1}^{n} \boldsymbol{B\,i} = \boldsymbol{B1} + \boldsymbol{B2} + \cdots + \boldsymbol{B17}$$

$$\sum_{i=1}^{n} \boldsymbol{B\,i} = \boldsymbol{6 + 32 + 86 + 11 + 65 + 10 + 8 + 16 + 3 + 40 + 10 + 265 + 40 + 20 + 7 + 9 + 1 = 629\ minutes}$$

formed

The following results are obtained when the time spent on the process in the object is removed from the network models and the logical algorithm of the operation performed in the warehouse of the loader, which is based on the algorithm designed for it[5-6].

In A_j (1-17) is a sequence of operations in the implementation of a process in the implementation of co-marketed operations. This logistic workflow was calculated in the case where the operations of the process, the total4 marketable V, V_5, V_6, V_8, V_9, V_{11}, V_{15}, were ignored by the software network models .

$$\sum_{j=1}^{n} \mathbf{B\,j} = \mathbf{B1} + \mathbf{B2} + \cdots + \mathbf{B17}$$

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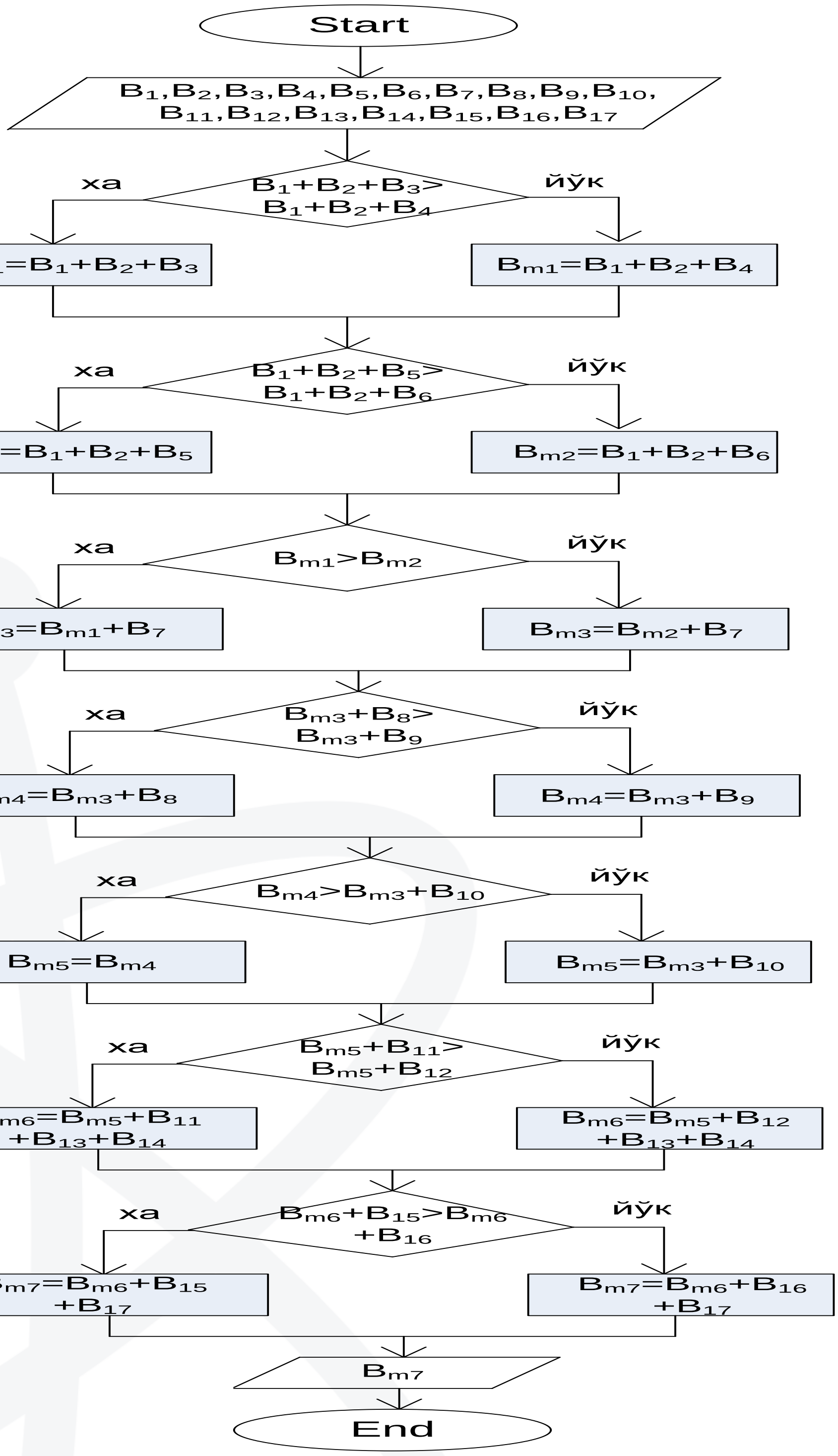
$$\sum_{j=1}^{n} \mathbf{B\,j} = \mathbf{6 + 32 + 86 + 8 + 25 + 280 + 40 + 20 + 9 + 1 = 507minutes}$$

19% through the construction of logistics terminal modeling network models and algorithms $\sum_{i=1}^{n} \mathbf{B} - \sum_{j=1}^{n} \mathbf{B\,j}$**=122minutes**



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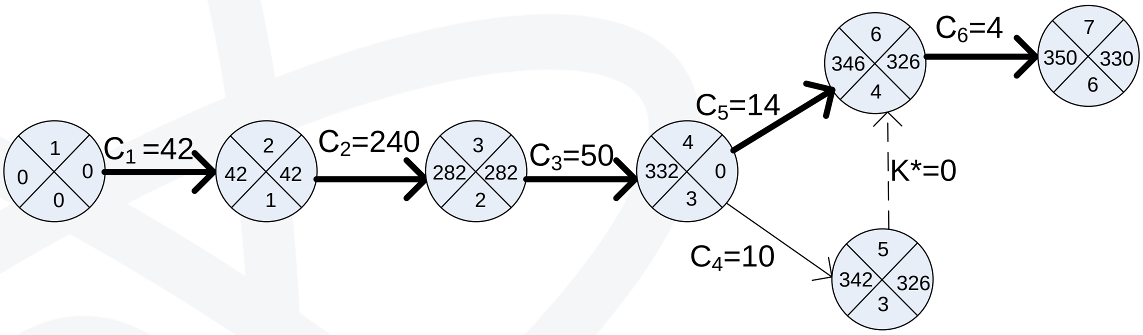
Results

Logistics is an algorithm created for the operation of the terminal in relation to the marketing sequence of stable operations. The operation of the logistics terminal has been optimized through network models and algorithms that benefit the transport process.

Table 1.3 Freight operations performed at the railway station

№	Performance	Members	Job definition	Previous work	Work duration parameters , min				Dispersion
					t_{ij}^{min}	t_{ij}^{nv}	t_{ij}^{max}	t_{ij}	σ_{ij}^2
1	Car cleaning	receiver, compiler	C1 _	-	30	40	60	42	25.00
2	Formation of the composition	Compile, at the station	C2 _	C1 _	180	240	300	240	400
3	Technical commercial inspection of the composition	station attendant	C3 _	C2 _	40	50	60	50	11.11
4	Train locomotive trailer	station attendant	C4 _	C3 _	6	on	14	on	2.25
5	Preparing for the departure of rolling stock	station attendant	C5 _	C3 _	10	14	16	14	1.00
6	Train departure	station attendant	C6 _	C4 , C5 _ _	3	4	5	4	0.44

1.3 - network construction model for freight forwarding station based on schedule. Timing of sequential operations on the transport object based on network models:



The sum of the total time of operations performed at the substation in the case of a series of operations on transport facilities:

$$\sum_{i=1}^{n} C\mathbf{i} = C\mathbf{1} + C\mathbf{2} + \cdots + C\mathbf{6}$$

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$$\sum_{i=1}^{n} C\,\mathbf{i} = \mathbf{42 + 240 + 50 + 14 + 10 + 4 = 360minutes}$$

formed.

The time spent on the process in the transport object is logically attributed to the network models and the operations performed on the station, which is the basis of the algorithm[7-8].

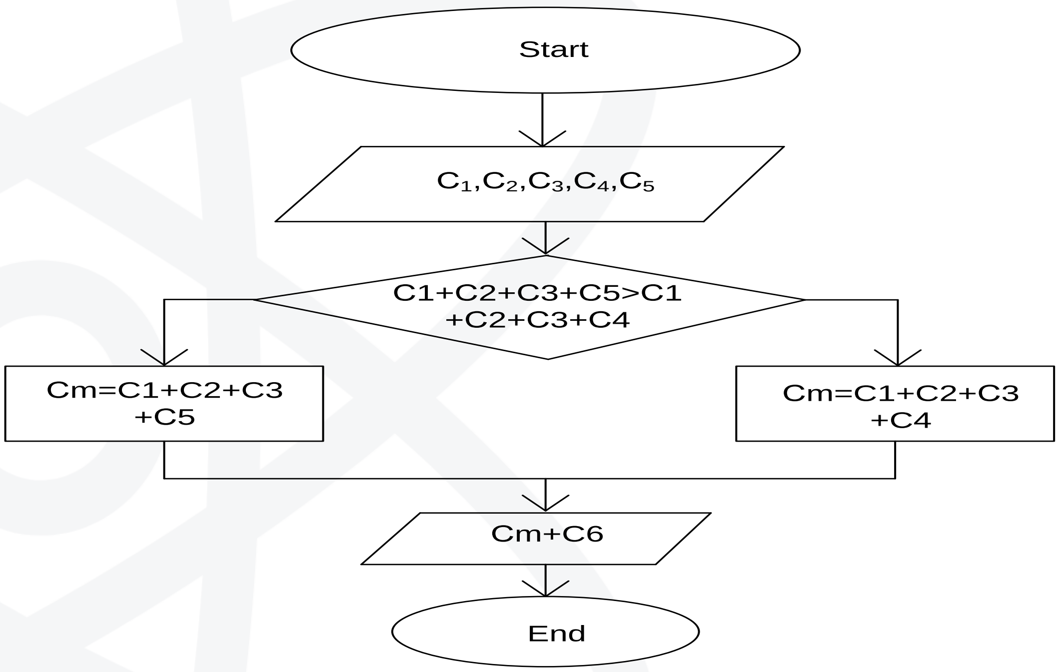
From j (1-) A sequence of operations in the implementation of a process to drop co-marketed operations. C , which excludes the operation of the general product marketed through the product network models to the working process of this freight forwarder .

$$\sum_{j=1}^{n} C\,\mathbf{j} = C\mathbf{1} + C\mathbf{2} + \cdots + C\mathbf{6}$$

$$\sum_{j=1}^{n} C\,\mathbf{j} = \mathbf{42 + 240 + 50 + 14 + 10 + 4 = 350minutes}$$

formed.

The basis of the logistics terminaling network models and algorithm for the construction of the freight is the transport process equipment $\sum_{i=1}^{n} C\,\mathbf{i}$- $\sum_{j=1}^{n} C\,\mathbf{j}$= **10** minutes or 3% ha.



Conclusion

Based on the time spent on the process at the transport facility, the network model and the algorithm based on it, it was found that there are no actions that can be performed together, given the logical dependence of operations on the receiving station. When transporting grain cargo on a universal platform, the time of the overall technological process is 95 minutes, as there are no joint operations in the warehouse of the consignee.

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