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Research Article

RESEARCH OF THE INFORMATION MANAGEMENT SYSTEM IN THE ORGANIZATION OF TRANSPORTATION OF GOODS ON THE RAILWAYS OF UZBEKISTAN

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ABSTRACT

This article explores the purpose, parameters and structure of the existing information management system in the organization of freight traffic on the railways of Uzbekistan. This system is called the Automated System for the Operational Management of Transportation (ASOMT), which for many years has been the main source of information for making managerial decisions.

KEYWORDS

Operational management, information management system, organization of transportation, railway transport

INTRODUCTION

It is advisable to study the information-control system of freight transportation on the basis of the General Systems Theory. According to the rules of the General Systems Theory, we can analyze the system in the following stages:

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- the purpose of the information management system freight traffic;

- elements that make up the information management system;

- the structure of the information and control system of freight traffic;

- functional structure of the information management system;

- interaction with the environment;

- the result of activity.

The information and control system is cybernetic in nature, since many interconnected objects - elements of the system, are able to perceive, remember and process information, as well as exchange information.

The purpose of the information management system freight transportation is a reflection of the current state of the operational work of the landfill for making managerial decisions in the organization of transportation.

On the railways of the Republic of Uzbekistan as an information management system freight transportation is considered to be the Automated System for the Operational Management of Transportation (ASOMT).

For a detailed study of the system, we denote the elements of the system that will significantly affect the achievement of the goal. An element of the system is an indivisible part of the system, from the point of view of the aspect of consideration, the solution of a specific problem, the goal set.

Elements of the information management system of the transportation process are divided into two types: dynamic and static. Dynamic elements change their characteristics over time and online. Elements of a statistical type do not change their characteristics in the online mode.

The dynamic elements of the information management system of the transportation process include (Fig. 1.1.). :

1. Train.
2. Railway carriage.
3. Locomotive.
4. Locomotive brigade.
5. Container.
6. Sending.
7. Loading.
8. Unloading

Static elements include:

1. Districts.
2. Line businesses.

When designating the elements of the system, we use abstraction, since during abstraction, insignificant details are omitted and attention is concentrated on the main common properties of a set of elements. Three types of abstraction are used: classification, generalization and aggregation.

Classification is the assignment of a set of objects to a specific element. In our case, covered wagons, gondola wagons, platforms, etc., are classified as freight wagons, since they have a common characteristic. As a result, we get the basic element.

A generalization is a grouping of elements into one generalized element. Generalization reveals the similarity of types. All objects related to basic elements are also generalized elements. Freight wagons have a common characteristic as non-traction rolling stock, and are listed under the generic element as Wagon.

Aggregation is the addition of one element to another in order to obtain one complex element. For example, a train element can be considered as an aggregate (complex element) of a wagon, a locomotive and a locomotive crew (Fig. 1.1.).

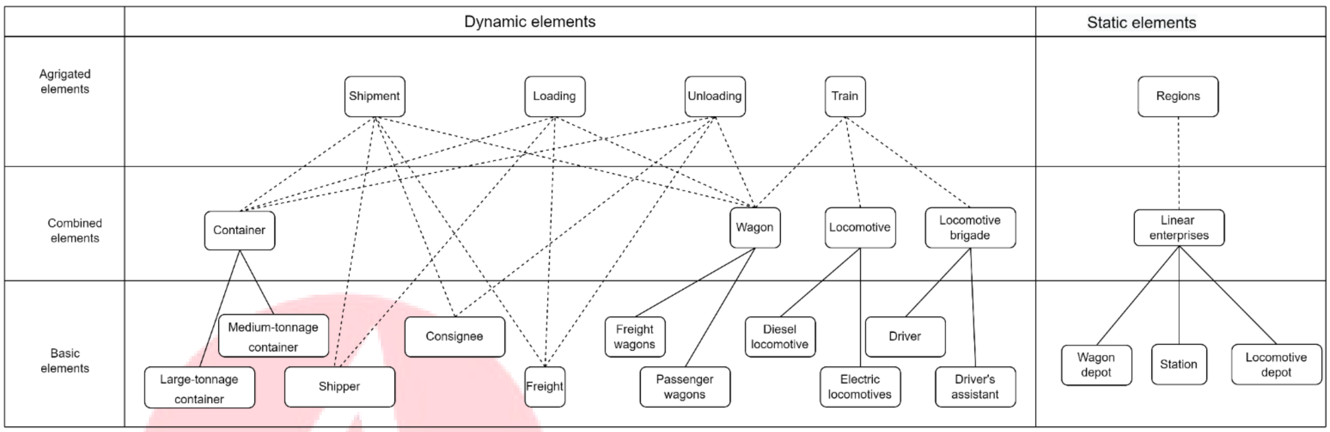

Figure 1.1. Aggregation and generalization of elements

Parametric study of the information model of the information management system

A parametric study includes the main elements of the system that will significantly affect the performance of tasks.

Train parameters influencing the information and control processes of freight traffic.

$$p = \{p_1, p_2, \ldots, p_k, \ldots, p_{n-1}, p_n\},$$
(1.1)

where $p_1$is the train number. It consists of a four-digit number and capital letters can be added to indicate the dangerous goods in the composition.

p_2– train index. Consists of the code of the formation station, the sequence number of the formation of the train, the station of disbandment.
p_3- a sign of decommissioning of the train, 1 - if the train was decommissioned from the head, 2 - if from the tail
p_4- date and time. Two-digit digits indicate the day, month, hours and minutes, respectively.
p_5- conditional length. It is measured by the conditional length of the car, characterized by a three-digit figure. Calculated automatically.
p_6- gross weight. Gross weight of the train, a four-digit figure that is calculated automatically
p_7- cover code. Cover code for the most dangerous cargo in the train. Calculated automatically.
$p_8$oversized index . A four-digit number, the sequence of each position means, respectively: lower, side, upper and

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oversized . Calculated automatically, the highest degree of oversize in the composition is selected.

p_9- livestock. If there are wagons occupied by livestock in the train, code 1 is affixed, in the absence - 0.

p_{10}- route. Numbers from 1 to 4 indicate the type of routes.

Car parameters that influence the information and control processes of freight traffic.

$$d = \{d_1, d_2, \dots, d_k, \dots, d_{n-1}, d_n\}, \quad (1.2)$$

where d_1 is the car number. An eight-digit wagon number that identifies the technical characteristics of the wagon.

d_2- bearings. Takes the value: 1 - roller bearings, 0 - plain bearings.

d_3- mass of cargo in tons. Natural number from 0 to 999.

d_4– destination stations. The station code according to the Unified Network Marking has 5 digital characters.

d_5– cargo code. Cargo code according to the Unified Tariff and Statistical Nomenclature of Cargoes, has 5 digital characters.

d_6– code of the consignee. 4 digital characters.

d_7– route, non-working park. Accepts numbers from 1 to 9, and each number has a specific value.

d_8- cover. Accepts numbers from 1 to 9, and each number has a specific value.

d_9– oversized, living creatures, long-wheelbase cars. Accepts numbers from 1 to 9, and each number has a specific value.

d_{10}- the number of fillings. The number of seals in the car is indicated.

d_{11}- containers. The number of containers transported in a loaded or empty state is indicated.

d_{12}- exit border station. Information about the first exit border station. 5 characters of the station code are indicated.

d_{13}- container of the wagon. The three-digit figure indicates the tare weight of the wagon.

d_{14} - note. Additional information alphanumeric format. The number of characters is 6.

Locomotive parameters influencing the information and control processes of freight traffic.

$$l = \{l_1, l_2, \dots, l_k, \dots, l_{n-1}, l_n\}, \quad (1.3)$$

where l_1- number of the locomotive. Numeric characters from 2 to 5 characters.

l_2- a series of locomotives. 3 digital characters.

l_3– type of route.1 digital character.

l_3- home depot. 4 digital characters.

Parameters of the locomotive crew element influencing the information and control processes of freight traffic.

$$g = \{g_1, g_2, \dots, g_k, \dots, g_{n-1}, g_n\}, \quad (1.4)$$

where g_1- payroll number of the driver. 5 digital characters.

g_2- the driver's name. Text letters.

g_3- home depot. 4 digital characters.

g_4- Brigade arrival time.

Container parameters influencing the information and control processes of freight traffic.

$$k = \{k_1, k_2, \dots, k_k, \dots, k_{n-1}, k_n\}, \quad (1.4)$$

where k_1 is the owner code. 3 letter characters.

k_2– type code. One capital letter

k_3- container number. 7 digits including check mark.

k_4- size code. Two alphanumeric characters.

k_5- country code. Consists of two letters

k_6- maximum (stencil) gross weight. Numerical signs in kilograms and feet.

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$k_7$is the tare weight of the container. Numerical signs in kilograms and feet.

k_7- the date of the next scheduled inspection.

Sending parameters influencing the information and control processes of freight traffic.

$$o = \{o_1, o_2, \dots, o_k, \dots, o_{n-1}, o_n\}, \quad (1.5)$$

where $o_1$is the dispatch number . Up to 11 digits .

o_2- name of the consignor. Up to 15 digits x characters .

o_3- name of the consignee. Up to 15 digits x characters .

o_4- the name of the station of departure of goods. Before 15 numeric characters . _

o_5– name of the destination station of the cargo. D o 25 numeric characters . _ _

o_6- name of the cargo . D o 15 numeric characters . _ _

o_7– mnemonic code and number of seats . Up to 4 digits .

o_8- mass of cargo, kg.

o_9- the total number of seats in the shipment . Up to 4 digits .

o_{10}– wagon or container number . Up to 1 1 alphanumeric characters . _

o_{11}– date and hour of completion of the loading of the wagon.

Loading parameters influencing the information and control processes of freight traffic.

$$q = \{q_1, q_2, \dots, q_k, \dots, q_{n-1}, q_n\}, \quad (1.6)$$

where $q_1$is the departure road code.

q_2– payer code.

q_2- departure station.

q_3- sender.

q_4– recipient station.

q_5- recipient.

q_6- the number of pieces of cargo.

q_7- the weight of the load.

q_8- packaging code.

q_9– cargo code ETSNG

q_{10}– code of the wagon owner.

q_{11}- the number of axles.

q_{12}- type of wagon.

q_{13}- special notes.

q_{14}- information about sending operations.

q_{15}- information about the container.

q_{16}- text documents.

q_{17}- information about the freight charge.

Unloading parameters influencing the information and control processes of freight traffic.

$$m = \{m_1, m_2, \dots, m_k, \dots, m_{n-1}, m_n\}, \quad (1.7)$$

where $m_1$is the unloading station code. 5 digital characters.

m_2– day-month and hour-minutes of unloading.

m_3- car number. 8 digital characters.

m_4– cargo code. 5 digital characters.

m_5– code of the consignee. 4 digital characters.

The parameters of static elements such as district and linear enterprises have names and corresponding codes of 4 digital characters long.

The structure of information systems is formed on the basis of database models, which is the source of targeted solutions. The model of the transportation process is developed taking into account the main required output solutions of the system. Based on the model, information can be provided to management personnel on specific requests. Since the model of the transportation process is the basis of an automated control system, proper structuring increases the level of system dynamism. The information database of ASOMT consists of the following models of the transportation process (MTP):

1. Train model of the road.
2. Locomotive road model.

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3. Wagon model of the road.
4. Brigade road model.
5. Container road model.
6. Starting model of the road.
7. Loading and unloading model.

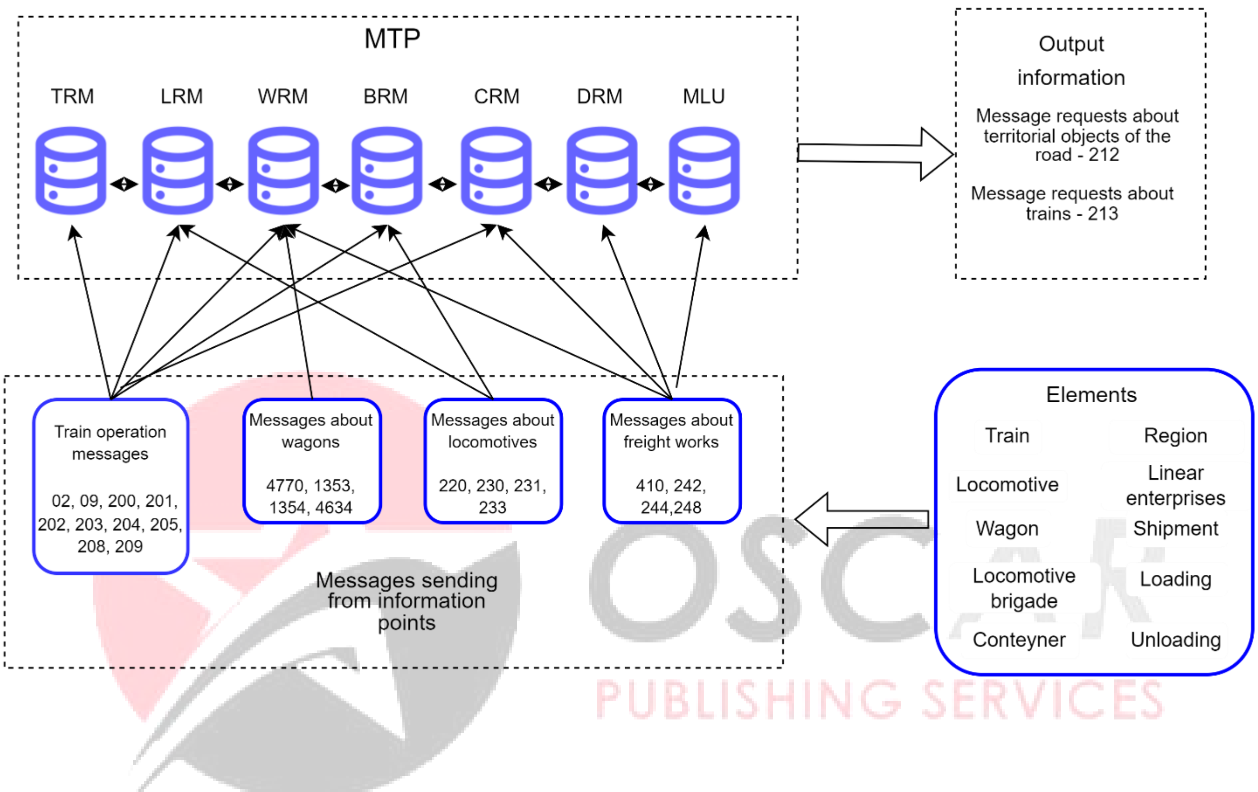

Figure 1.2- Structure of ASOMT

Train Model Road (TMR)

Includes information about the composition of trains and operations with them throughout the journey. Information points on actual transactions send messages to ASOUP. After processing the data, the train model of the road reflects the state of the train position on the road. The processes from the beginning of the formation of trains to the disbandment are fixed by the system according to the train index. The history of the operation of each train is kept. The train model provides the following information:

1. Information about each wagon composition.
2. General information about the train.
3. Work with the train and the route.
4. Information about the locomotive and the locomotive crew serving the train.
5. Information about restrictions (shaping plan, weight and length norms).

Wagon road model (WRM)

The main object of control is the wagon. The priority of information support concerning wagons is the highest. As an element, wagons are taken into account in a full-scale way. Most of the operations performed with wagons are recorded by information points. As a normative-regulating array of information, an automated data bank of the freight car fleet (ABD PV) serves. The automated data bank of the freight car fleet is a collection of information bases containing information about the owners, lessees of the cars, the technical characteristics of the rolling stock, information about the scheduled and ongoing repairs of the cars, the range of goods allowed for transportation, about the permitted areas for the cars to run.

WRM makes it possible to reflect the following data:

1. Information on the availability of wagons by station, sections, international connecting points and by type.

2. Information about the location of wagons by type, by cargo in the wagon, by destination station and by accessory.

3. Information about the deployment of special rolling stock and empty wagons.

4. Information about statistical data on the operation of wagons.

Locomotive road model (LRM)

The locomotive road model serves to provide the following information about locomotives:

1. locomotive deployment.

2. Average daily performance of a locomotive in freight traffic in ton-kilometers.

3. Locomotive mileage from all types of repairs.

4. Average daily mileage in freight traffic by type of traction.

Thus, depending on the state of the locomotives, the provision of trains with locomotives is controlled. The information in the model is updated based on messages sent from the information points.

List of reports from sources about the operation of locomotives:

1. Message about the departure of the train - 200;

2. Message about the arrival of the train - 201;

3. road exchange message about the operation with the train, about the locomotives and crews following with it - 220;

4. Message about changing the state of the locomotive - 230;

5. Message about the unification and separation of the locomotive section - 231;

6. Notification of a change in the controlled fleet of locomotives - 233.

Container Road Model (CRM)

The container model of the road provides the following information for the organization of cargo transportation:

1. The current state of the container;

2. Dislocation of the container;

3. Search for a container by wagons;

4. Working with a container

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The main message for entering information about container shipments is a message prepared on the basis of shipping documents: message 410 about the acceptance of cargo for transportation (about sending). In addition, information about containers is entered on the basis of the train transfer list in the form of messages p. 421 and 422. The crediting of a container shipment is issued by message 402. The exchange of information about containers between roads is carried out using messages 4770 (0) and 410. To reflect in the CMD information about the movement of a container (car with a container) along the road, train messages 02, 09, 200-205 and others.

Brigade road model (BRM)

Operational control of the deployment and work of locomotive freight traffic crews (OKDB). The object of control in solving the complex of tasks of the OKDB is the locomotive brigades of freight traffic in the areas of their work within the road.

At the road level, the following main tasks are to be solved:

- accounting for the presence of locomotive brigades of freight traffic in the areas of their work, as well as points of registration and turnover;
- operational control of the mode of work and rest of locomotive crews;
- operational control over the implementation of the nominal work schedule of locomotive crews;
- accounting of hours worked per month by machinists and their assistants;
- accounting for the presence of a contingent of locomotive crews;
- operational analysis of the use of working time of locomotive crews and rest time at turnover and home points;
- formation of a list of indicators transmitted to the Main Computing Center of the MPS for solving tasks of the MPS level with the aggregation of calculation results required for the MPS.

The following information should be sent to the VC of the road:

- from allocated stations - the personnel number of the driver, the time the brigade came to work, the time the brigade handed over the locomotive;
- from the depot - the personnel number of the driver, the time the brigade appeared at work, the time the locomotive was handed over by the brigade, the time of arrival and departure of the brigade by the passenger, data on the cancellation of the brigade's attendance; reports on granting the brigade a day off, on the time of illness of the drivers or assistants, diverting them to other types of work, data on secondment or granting leave to the brigade, on hiring and dismissal from work of locomotive brigades;
- from the road department - data on the extension of the established duration of continuous work of the brigades by order of the leadership of the road department, indicating the reasons.

The basis for solving the set of tasks of the road-level OKDB is a dynamic brigade road model (BDM), which includes data arrays about changes in the location and state of the teams, as well as the actual development of working hours for each of them.

The BMD keeps records of locomotive crews - separately for drivers and their assistants.

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Departure road model (DRM)

The departure model of the road serves for the number-by- number control of each dispatch and the advancement of the departure and step routes.

The main source of the model is messages 410 and 242, respectively, about the acceptance of goods for transportation and about unloading.

Loading and unloading model (LUM)

The loading and unloading model allows you to solve the following tasks:

- number-by- number information model of loading and unloading of wagons by railway stations;
- accounting for the cargo work of stations and departments, roads with the preparation of daily operational reports;
- operational control over the progress of cargo work
- operational control of cargo work within the road, territorial control centers, stations and the most important customers.
- accounting for changes in the state of the wagon fleet, necessary for accounting for wagon fleets ;

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