Automatization of Transport Logistics Company

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Abstract. There is an observation of the transport logistics field of companies in Russia especially the automatization of business processes in this area in this article. There is a discussion of development of the system that provides communication between the Manager of the company and cars which deliver the goods. Integration of my solution can provide solution to major problems faced by companies engaged in transportation: a few information about order status, current location of the car.

Introduction

Transport logistics – collection of objects and entities of transport and logistics infrastructure together with material, financial and information flows between them performing the function of transportation, storage, distribution of goods, information and legal support of trade flows [1].

Results and Discussion

Transport logistics consists of [3]:
- forecasting and organization delivery of the goods;
- registration of related documents;
- legal support of transportation goods;
- payment for transportation services;
- loading and unloading goods;
- packing and warehousing goods;
- process optimization;
- information support;
- additional services (insurance, custom house services).

The main goal of transport logistics – organization of timely transportation of goods with minimum costs [4]. To achieve this goal you must perform the following tasks:

On the first stage Manager of transport logistics creates the route of transportation with taking into account the local geography and type of cargo.

Characteristics of the cargo largely affect the future choice of transport and route development. For example, how bulky, heavy or fragile good is will affect the choice of vehicle. Only after the definitions of the properties of the cargo the choice of the transport should be made.

Logistics costs largely depend on the chosen type of transportation. The most important criteria in transport logistics are: speed of delivery, cost and time [5]. In addition, the vehicle is chosen on the basis of:
- the characteristics and values of the cargo [2];
- the number of batches and frequency of transportations;
- distance and characteristics of the location of the destination.
After discussing with customer, analyzing the geography of destinations and selecting the vehicle type, Manager proceeds. On the first stage, Manager of transport logistics creates the construction of possible routes. Several options are calculated with the method of analysis of total cost. The most preferred route has the lowest cost.

It often happens when after the picking of the final plan climatic, political, and other conditions make adjustments to the route [6].

Modern logistics companies use all possible navigation devices to avoid force majeure and have extra time for correcting the route.

It is also very important to keep the customer informed about current status and location of his cargo [7].

Lots of time and money are consumed for transportation of goods. That is why transport logistics must be configured to receive profit in financial terms [8]. The largest gains can be received with:

- Reduction of the stocks in warehouses and transit (it «connects the capital»);
- Minimizing costs in product and material resources;
- Increasing the range and quantity of transportations;
- Preventing damage and loss of cargo.

**Structure of automated process.**

For quick and easy solution to the problems of transport logistics, it is often used special software (Transport Management Systems. TMS) [9].

Such systems calculate the routes basing on model of the transportation network, transport’s crossing in certain urban areas, the quantity and weight of cargo. The solution enables a visual comparison of planned and actual routes on online map. As a result, you can get the route deviation from the plan, eliminate vehicle’s disusing, unreasonable delays and also solve a number of other analytics tasks [10].

Company «AutoKolonna 72» provides services for transportation of different goods all over the territory of city Tyumen. Clients of this company – private companies which have goods needed to be transported around the city.

Basing on the analysis of the company’s work, it is possible to create a model of the automated process (Fig. 1). It includes main processes involved in transport company.

![Figure 1. Model «AS-IS» of automated process](image)

In the end, due to the system implementation, the request processing time will be reduced; no longer need to contact each car to figure out its’ location or transfer information about the current order via phone. The number of errors associated with the slow transferring of information is minimized (Fig. 2).

Automation has affected such aspects as:

- order creation;
  - selection of optimal transport;
- selection the optimal route;
- transferring of order information;
- controlling the compliance of the order;
- reporting and analyzing activities of company.

**Figure 2. Model «TO-BE» of automated process**

**Selection of optimal transport.**

System allows Manager to automatically choose the optimal transport for compliance of the current order. Due to the fact that each car contains a single smartphone with Android OS that will contain installed application Manager has an opportunity to get the exact current location of the vehicle on the map (Fig. 3). Basing on the current location and characteristics, load size of the car system can automatically choose the most appropriate set of vehicles that will be able to complete the order.

**Figure 3. The process of transferring data between the Manager’s system and the car’s system**
Selection of optimal route.
With using vehicles chosen through the selection of the optimal transport and information about traffic congestions on the city queried from Bing services system determines the most suitable car that can complete the order within the deadline.

Any information is taken into account with ability of the system to analyze any specified requirements and constraints. This causes the minimization of influence of «human factor».

The main characteristic used in automatic selection of optimal route is parameter $Ti$ (coefficient of optimality of the route) (1).

$$Ti = t + L/B$$

$Ti$ - coefficient of optimality of the route; $t$ – the difference between the boot time and current time; $L$ - the length of the route from the current coordinates of the machine to the coordinates of the point of loading; $B$ – total score of traffic jams on the route from the current coordinates of the machine to the coordinates of the point load.

Route length ($L$) is the result of a query to Bing.Routes. In the query transmitted the coordinates of the machine and the coordinates of the point load.

Total score of traffic jams on the route ($B$) is the result of a query to Bing.Traffic. In the query transmitted the coordinates of the machine and the coordinates of the point load. On the service side, there is a calculation of the average level of congestion on a given route.

Transferring information about order to the vehicle.
The system allows reduction of the time spent on creating routes (Fig. 3). Orders are disturbed across cars automatically (Fig. 4).

Figure 4. Representation of order information in the system of the car
Controlling the compilation of the order.

Due to the interaction of the Manager’s system and mobile devices with installed application it is possible to record: time of arrival and departure to the place of loading/unloading the cargo, the fact of compilation of the order.

In case of changes in the order Manager will be able to correct the data for the system. The changes will be immediately sent to the mobile devices with installed system of cars.

The system is successfully integrated with the navigation systems of satellite monitoring of mobile devices that allows Manager to track the location of vehicles and cargo and to use this information for possible changes to the routes and for more control over the process of cargo’s transportation by vehicles (Fig. 5).

Figure 5. Map visualization in Manager’s system

Reporting and analysis of the company.

The problem of managing the transport business without using information systems is the difficulty of collecting, processing and analyzing of information.

Integration of the system allows Manager to monitor and analyze orders. Load factors, produce accounting of settlements with clients that providers company with opportunity to access key performances indicators and make strategic management decisions (Fig. 6).

Figure 6. View the history of the car's movements in the Manager’s system
Effect from integration

There were made several calculations concerning time spent for managing different processes (Table 1).

For the choosing of car and transferring order before integration it took about 16 minutes; after integration – 6 minutes.

Table 1. Results of business analysis

| Process                                         | Before Integration | Time spent, [min] | After Integration | Time spent, [min] |
|------------------------------------------------|--------------------|-------------------|-------------------|-------------------|
| 1. Manual choosing of the car                   |                    | 1                 | 1. Creating order in system | 5                 |
| 2. Phone call to cars for correction of its’ status and location |                    | 5                 | 2. Automatic choosing of car | 0.5               |
| 3. Phone call to cars to transfer information about the order |                    | 5                 | 3. Transferring information about the order to car | 0.5               |
| 4. Creating the order in system                 |                    | 5                 |                   |                   |

While the average number of orders (20-35) a day and with using data form Table 1, it can be estimated that a Manager spends 5.3 hours up to 9.3 hours a day only to create order in the system. After the integration these indicators will be from 2 hours to 3.5 hours per day. That saves about 37.5% of time.

By saving time the number of orders can be increased from 12 to 21 additional orders per day).

Conclusion

The specificity of the conditions of transportation of cargoes, improvement of technology of production in the fields with every day are placing greater demands on the quality of the transportation process, ensuring rhythmicity (regularity) of transportations. Therefore, one of the main activities of the transportation companies is development of system for such transport provision, that would not only satisfy all demand for transportation, but also to guarantee their quality, especially the rhythm.

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