

Control Model of Road Transportation

E. Posch, J. Kovács

Széchenyi István University, Egyetem tér 1. H-9026 Győr

Phone: +3696613557, fax: +3696613555

e-mail: kovacs@sze.hu, evelin@sze.hu

Abstract: Transportation of goods is a complex system, which is only possible to control by coordination of human and material elements involved. Controlling the road transportation company is a series of complex tasks and activities. Preserving competitiveness requires effective utilization of available devices and resources, high quality performance and satisfaction of the consigner party. In consequence, it has practical reasons why we do have the extremely lot of information. Thus, it is highly deemed to improve theory to keep up with or come before the speedy development of technology. Our research work aims to find a solution for this problem.

Keywords: Information system, transportation controlling, effectiveness off transportation, complex controlling system

1. Introduction

Road transportation of goods is a process spread in space. After starting the actual transportation process central control is hard to realize, as no effective interference is possible. However, transportation needs control where some feedback is given depending on available communication channels.

Transportation companies strive for improving utilization of transportation implementations, though, which is difficult to carry out by applying traditional methods.

Info-communication technology enables realization of controlling the transportation process. Being reinforced in everyday practice, some of its elements are working but still there is no detailed, systematic model available, which can be applied on the specific field of transportation.

The aim of the present research is to establish a general controlling model, which gives a unique systematic analysis of road transportation processes, complicating factors of these, interference possibilities, places and methods. The model is also used for effective controlling of transportation processes by applying up-to-date information technology and methods.

The article focuses on the conditions of and approaches to modeling. The study presents practical and theoretical solutions used on the transportation market for forwarding goods to their proper destination.

Although there is a quite clearly set system of terms concerning transportation, it is necessary to define some terms to have a unique basis of approach. The study specifies the tasks, implementation and processes of transportation, which contributes to making issues described in the present study transparent. After describing road transportation processes the article moves on to revealing the issue „Why does the transportation process require control?“ from various aspects.

2. Defining road transportation

Transportation can be examined on the whole and in details. Transportation is mostly considered as part of a commercial process, where it is not important if the carrier forwards its own or another company's products. However, in the present article transportation of goods is considered 'only' as part of transportation.

The carrier does not consider economic processes required to the actual transportation task, as transportation is just an activity to realize by using specific technology. Thus, transportation is an uncomplicated activity with three actors involved, and with the *carrier* in the centre of activity.

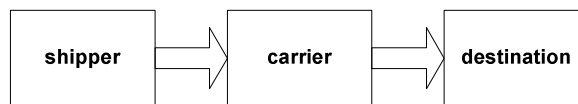


Figure 1. Raft model of transportation

From the aspect of the carrier transportation is a production task. Transportation, that is the *company objective* is regarded as the *primary company process*. Other processes like management, additional activities are subordinated to and responsible for realization of the primary company process.

The aim of the carrier is to have constant and effective economic achievement. Its realization is only possible by keeping time, quality and not exceeding costs.

This requires appropriate planning and its realization. So, transportation is a control task (see Figure 2) where drivers carry out tasks by regarding the set plans. Realization of transportation is strongly affected by complicating factors, which often results in deviating from the plans.

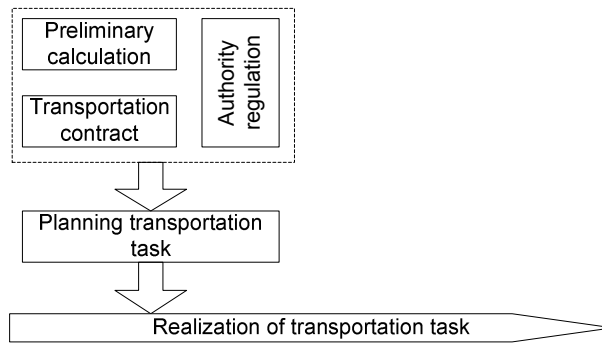


Figure 2. Transportation as a control task

3. Demand for controlling transportation processes

The way of realization of a transportation task can be planned. Effective planning today is aided with information technology involving local implementation, network based services, GPS, information data bases. There are, however, plenty of factors affecting and complicating transportation process from the sender to the destination:

- traffic jam, blocks, diversion due to accident
- decreasing ability of driver's concentration (e.g. due to extremely heavy traffic)
- unexpected change of weather conditions
- technical problems
- damage on the goods
- driver's illness
- missing the connection by combined transportation
- waiting (e.g. customs)
- other problems

Deviating from the plan results in financial and/or moral losses for the carrier, therefore the carrier obviously makes efforts to solve the problems emerging during the transportation.

In the planning phase one must consider factors affecting transportation, and that is why some reserves have to be calculated. To solve the problems the driver takes own decisions based on previous experience, which is effective in most cases. The driver may ask for instruction (on the phone) if the problems are beyond the driver's competence.

Effectiveness of transportation is shown in the function

$$E_T = f(I, T, Q)$$

where

I – income from realizing transportation task, $I=P_A - C$, aim: I_{\max}

P_A – agreed price (for transportation),

C – total cost of transportation,

T – time difference compared to agreed time, $T=T_A - T_R$, aim: $T \geq 0$

T_A – time of realization agreed on, set in contract

T_R – time of realization

Q – quality, no damage

The above approach is applicable for one concrete transportation task. At company level several tasks are carried out in a specific period of time. It is impossible to reach maximum effectiveness in realization of all tasks, and there are also cases when business policy requires tasks calculated with losses. The consequence is:

$$E_c^n = \sum_{i=1}^n E_i$$

where: E_c^n – company effectiveness in a specified period of time (n)

The bigger the company is and the more transportation tasks are carried out simultaneously, the less effective solution is to take private decisions on solving problems restricting transportation. The best way is to prevent complicating factors or at least minimize their affects.

For proper transportation there are three conditions to fulfill:

1. The dispatcher must be provided with all necessary information concerning all transportation tasks.
2. It is necessary to elaborate an evaluation and decision algorithm which makes information processing and decision making possible.
3. The driver must be informed on the decision in time.

Information on task management is sent continuously to the dispatcher who can evaluate and check phases of task management and intervene when necessary. Due to continuous feedback control comes from a higher organization level.

The aim is to establish a complex control system model, which, by using information technology, cumulates information with the dispatcher on all complicating factors occurring during the transportation. The dispatcher is enabled to make fairly optimum decisions after evaluating the incoming information.

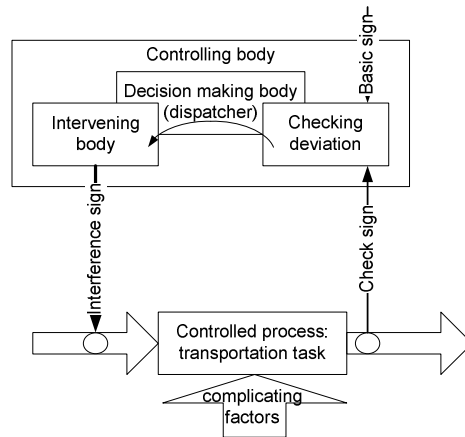


Figure 3 Controlling model of transportation

4. Information basis of the controlling process

Some pieces of information concern different units involved in transportation (vehicle, goods, driver), nevertheless, most pieces of information are independent of these. Basic information types concerning control task are:

- geographical position and condition of units involved in transportation
- complicating factors and restrictions occurring during transportation

There are several technical solutions (e.g. GPS) for managing problems of the first type as they are able to provide all required information. There is no satisfactory amount and definition of information available on the latter type of problems, or rather real time information transfer to the dispatcher is not possible by the present technology.

Due to the latest IT technology applications there is an enormous information flow in the present transportation system. This huge amount of information is not systematic, which contradictorily increases uncertainty about transportation processes instead of minimizing or stopping it.

The primary aims of the planned research are revealing and systemizing the information types which occur during transportation and affect it, and those which emerge in infrastructural setting and affect transportation processes, and furthermore establishing a control model applicable for utilizing information.

Time is an extremely important factor by information utilization. Control is only effective if information on problems occurring during the transportation process is forwarded well in time so that measures for problem management can be taken.

5. Conclusions

Transportation of goods is a complex system, which is only possible to control by coordination of human and material elements involved. Controlling the road transportation

company is a series of complex tasks and activities. Preserving competitiveness requires effective utilization of available devices and resources, high quality performance and satisfaction of the consigner party. Speed, reliability, realistic prices are dominant when selecting a carrier. All these factors are strongly related and complex controlling systems depend on each other. There occur several complicating factors during the transportation activity, which, combined or one by one, barrier task realization. It is obvious that it is not possible to prevent or foresee all these difficulties (e.g. bad weather conditions, blocks, diversion) but their affects can be minimized.

Service quality of transportation companies is mostly determined by utilization of information technology. The market offers various implementations and technology which aid transportation task management. It needs, however, further examination, to what extent these are applicable for the actual purposes. At the same time, the system of necessary information also needs consideration both in terms of information technology and transportation, since due to the multiplicity of up-to-date technology the amount of information is continuously increasing. The ever increasing amount of information does not definitely mean higher effectiveness. It has practical reasons why we do have the extremely lot of information. Thus, it is highly deemed to improve theory to keep up with or come before the speedy development of technology. Our research work aims to find a solution for this problem.

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