Draft of Information system for timber haulage

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Abstract

Many large companies in the Czech Republic involved in timber transport bitterly feel an absence of useful and competent information systems in this field of their activity. An absolute majority of transport modules implemented in big accounting and filing systems are focused on truck haulage or bus transportation. Timber haulage from the roadside landing has to face problems such as heterogeneous kinds of transported material, poor payloading of vehicles, seasonal character of work, climatic impacts. This is why the processing, optimization and a possibility of flexible reaction put high demands on the information system as well as on managers involved in timber haulage. An information system was designed that strives to respond to the existing absence of information system in timber haulage and transportation of sawn timber and wood-based materials.

Keywords

information system, timber haulage, diagram, transport

Introduction

There are a lot of entities involved in the transport of timber, wood-based materials and sawn timber. Small firms with just a couple of transport means usually do not employ extensive information systems in their work but rather use small applications to facilitate partial activities in the process of transportation (Pokorný, 2005). Medium-sized and large companies with sizeable fleets have to face the issue of optimization of transport cases in order to enhance the economic efficiency of operations (Šmerda, 2005). The number of information systems including the module of transport is high on the Czech market but most of these systems are designed for truck haulage or bus transportation. Timber haulage from the roadside landing is characteristic with a high share of "empty" turns with a greater part of transport running in one direction and with the back-drive payload being a limiting factor with respect to transport economy (Heinimann, 1999) .

The objective of this study is to design an information system capable of covering factors limiting and affecting timber haulage from the roadside landing.

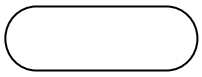
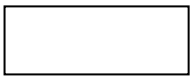
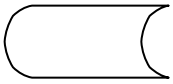
Draft information system

This draft information system was designed for larger companies with a greater number of vehicles dislocated on separate remote workplaces. All workplaces have an access available to the system and work with data on multiple levels. Furthermore, the system is accessible through the control mechanisms both to clients ordering the transport and to final customers – goods recipients.

Information system requirements:

- to enable data acquisition on the web platform or via a very simple form (web interface, structured e-mail)
- to include modules of production, human resources and wages
- to optimize and monitor axial transport up to the level of meeting points on the basis of selected criteria
- to acquire on-line information about the condition and movement of vehicles
- to maximize provided services by ensuring transport for contractors with a maximum employment of own fleet
- to optimize and/or seek solutions also for other types of transport such as wagon and combined transport.

Elements used in the diagram are as follows:

Terminator – user of the system	
Process – activity, using the stored data, generating the stored data	
Stored data – database	

Description of the diagram

Client: Produces requisitions for timber haulage, receives information about acceptance and filing of the requisition, information about the planned term of haulage, ensures haulage organization from the place of vehicle lay-on (meeting point) to the place of loading, receives information about implemented haulage. Pieces of information that can be decisive for laying on an optimum vehicle are listed below:

Name of the group	Items
Meeting point	Unit, division, site (recommended is the generation of own numerical database series)
Client	Name, function, telephone
Date and time	Precise date if required, otherwise date from-to, hour from-to facilitating freedom in laying-on the vehicle
Loading terms	Distance from the meeting point (expected time spent for driving from meeting point to roadside), arrival road (type, carrying capacity) technology used (horse, tractor, forwarder), number of turns, waggonning (if required)
Final customer	Name, place of delivery
Recipient's terms	Bench stacking, drive-up time, max. load limit (if some limiting conditions are set up)
Commodity	Timber species, length, assortment, volume

Stock entry in the respective timber yard is made on the basis of haulage requisition. Haulage requisitions are to be entered into the database of timber haulage requisitions. Data from the database are entered into the program of optimization.

After the implementation, the system makes in the case of necessity corrections in stock release in the case of bulk orders for a larger volume of goods.

Commodity: Represents a prepared assortment that is specified by its properties. Categorization is made according to the focus on transported commodity – e.g. sawn timber/round timber, species spruce, pine, etc., assortment – long-short logs, length.

Vehicle: Means of transport – own or contracted. It is necessary to ensure and keep records on the vehicle identification, parameters of vehicle type and equipment. It is advisable to keep further records of own vehicles concerning repair costs, fuel costs, average fuel consumption, working hours, planned overhauls affecting working hours and employment restricted only to certain transport points.

Basic technical parameters of the vehicle:

- vehicle type, trailer type used, cage equipment
- vehicle carrying capacity
- platform truck definition (spacing of stanchions)
- hydraulic log grapple, its location on the vehicle, carrying capacity
- crew requirements (1, 2 drivers, driver's mate)
- terrain accessibility, drive on individual axles, all axles powered
- parking place

Timber yard: One warehouse is allocated to one client. It represents the commodity whose transport is ordered by the client. By the summarization of partial warehouses for individual customers these can be informed about scheduled deliveries or the customers can be provided an access to the database for the purpose of evaluation.

Transport point: Transport point is understood a meeting point, unloading point at customer's or a parking place where the vehicle can be put aside. There is just one route between two points, determined by distance in kilometers and in time. The distance in kilometers and in time can be updated on the basis of travel records. The initial filling of route list is recommended to make gradually so that the database will be filled along with new transport requisitions from customers.

Haulage optimization: A key process of the application is optimization of transport for which development of an automated algorithm is most frequently required together with a possibility of subsequent manual correction by transport supervisors (dispatchers). With respect to a great number of parameters affecting the optimization and regarding a great number of priorities (e.g. priority of route, priority of preferential deliveries to a certain customer, priority of term ...), the optimization can be left to dispatchers who will assert their practical experience. Dispatchers are to be provided a proper environment with auxiliary mechanisms enabling the selection of haulage requisitions by customer, by vehicle type, place of loading, etc. The auxiliary mechanisms should at least prevent an advance offer of requisitions accepted for implementation by another dispatcher and an advance offer of vehicles that are out of operation on the given date or that are scheduled for another operation than haulage and the like. All data are to be stored and evaluated and an analysis is to be made

at a following stage, according to which an optimization algorithm will be prepared or more algorithms best suiting conditions of the entity.

The system should make it possible to advise cases with the risk of expiration and/or delay. It should also enable the advising according to adjusted haulage priorities.

Dispatcher: is to perform activities as follows:

- provision and updating of data on by him managed fleet and crew for the purposes of analysis and optimization; subcontracting of scheduled vehicle repairs, planning of driver resources, time consumption for individual routes, transport distance.
- provision of data on vehicle repairs
- optimization proposals or corrections in the case that an optimization program has been already implemented within the system and/or adjustment of priorities for the optimization model
- checking of own or external resources for non-implemented haulage requisitions, provision of draft alternative solutions for non-implemented haulage requisitions
- inactivation of requisitions from the database of requisitions in the case of order cancellation
- issue of travel orders.

Driver: is given travel orders, provides primary records in the statement of vehicle operations and records concerning vehicle repairs and maintenance treatments. The database of drivers should include an unambiguous identification of the driver, name, contacts and working hours. Driver is employed by the submitter and/or sub-contractor (in this case more less only contacts are required).

Travel order: includes the following basic information required for the implementation of individual transport cases: start and end travel points, vehicle, driver, haulage requisition, date and time of travel beginning, date and time of travel end, commodity and volume, mileage in kilometers and total time. Goods release from the warehouse is made on the basis of travel order. The client is informed about the transport schedule (structured SMS with a meeting point, expected time, contact to driver and dispatcher appears to be most suitable).

Report of haulage: includes data on realized haulage according to reality. This is a primary provision of data by the vehicle driver. In the case of own employee, the information is passed over to the dispatcher who will ensure its introduction into the system. In the case of contractor, the data are required as attachment to invoice. The report of haulage will serve as a fundamental document for invoicing the client.

Customer: is a business partner to the client, to whom the goods is supplied. There are unloading points allocated to each customer. The system should be prepared for the entry of customers into the system for them to be able to monitor the balance of supplies.

Evaluation

If the system is introduced all data from the orders and from the haulage reports, an evaluation can be made by vehicles, routes, drivers, dispatchers in cost and yield values, in unit values: m^3, m^3/km, t/km etc.

It is also possible to evaluate the fulfilment of monthly, quarterly and annual haulage plans and to do a current monitoring of their fulfilment in details of localities.

Other recommendations

The recommendations were done in respect to discussion with Ptáček (2005).

It is advisable that the module is implemented into information systems including the book-keeping and accounting modules as this draft system is designed to produce a final document for invoicing. The use of the information system together with the accounting and book-keeping module will facilitate further activities such as:

- Registration of own vehicles as assets including their depreciation and related accounting
- Output to the module of Wages for drivers
- Possibility of accounting for stock records
- Possibility of accounting for issued invoices
- Working directly with the records of received invoices and related accounting in the monitoring of costs per vehicle
- Monitoring of the payment of received and issued invoices
- Money flow monitoring
- Monitoring of other warehouses
- VAT records
- Accounting management
- Managerial outputs.

With respect to HW and data protection, it is advisable that the application is operated on two servers – one database server and one application server. The proposal of system protection and safety should be preferably designed on several levels as follows:

- Data protection in the allocation of access rights to individual users
- Protection and security of HW
- Data protection within the framework of remote access to the application.

Safeguarding of access and data must be in the case of technology operation through the internet paid an increased attention the reason being the open character of internet. Most sensitive data of the information system are those stored in the database server. As a primary security measure the operation of database server and application server working for internal network, which are to work in a protected zone, should be separated from the application server for internet.

Support of a multi-lingual environment is recommended with respect to the system employment in abroad (foreign partner). The system should enable a simple generation of individual or parallel structure of user web sites providing the same content of information and the same work procedure for example in English, French, German or in other languages.

With respect to a possible provision of services in different areas of transportation it is advised that the system has a parametric solution. The system should make it possible to accommodate to customer (user) requirements – to generate for all system users their own web-sites that would features only activities assigned to them within the framework of their functional rank in the company and required for their work. This working web-site will enable the user to have all required resources and activities well arranged and instantly accessible. Adjustment should be made possible from the level of user, group, division, department up to the whole company.

The system should also meet the requirement of easy remote administration and maintenance, which would markedly reduce service costs, response time and costs of operator training.

Acquisition of on-line data about the condition and movement of vehicles can make use of GPRS. There are systems available today on the market that are capable of providing on-line information about the vehicle condition in a lot of criteria (according to the number of sensors installed on the vehicle) and about the vehicle position.

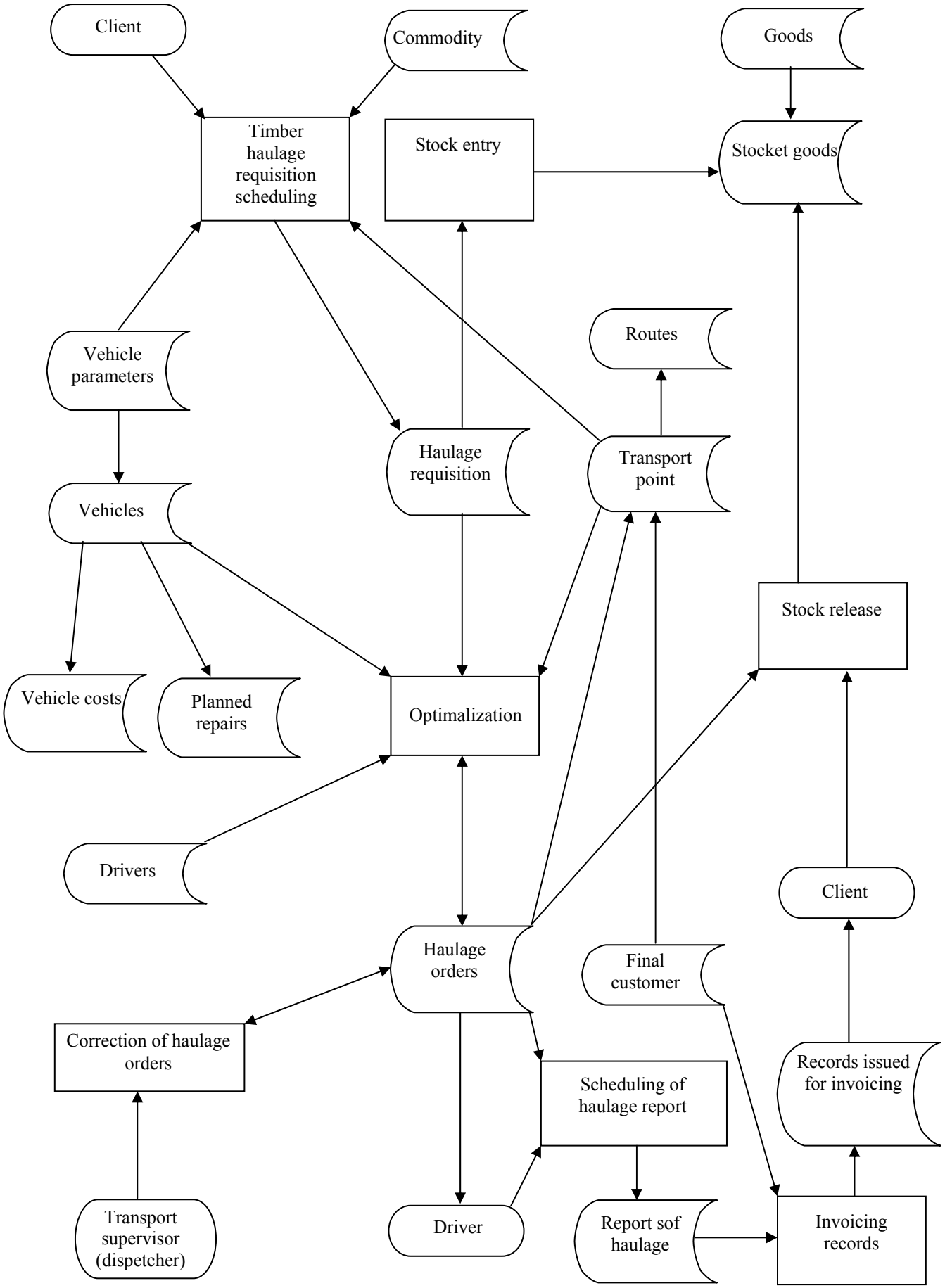


Fig. 1 – Diagram of the proposed information system

Acknowledgements

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