

Problems of Inter-organizational Interaction of Participants in Motor Transport Cargo Shipments

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Abstract

Background/Objectives: The study considers currently important problems of inter-organizational interaction of participants involved in automotive cargo shipments and implementation of such concepts as “Just-in-Time” and “Just-in-Sequence” in scheduling practices. **Methods:** The applied Six Sigma methodology is focused on the client’s wishes and requirements for cargo delivery, according to which the slow processes are expensive. The applied “lean production” method is based on the fact that shipping time losses occur during transportation and waiting time. Thus, a refined methodology has been developed synthesizing “Lean production” and “Six Sigma”, one of the tools which is the concept of “just in time” delivery. **Findings:** It has been concluded that one of the reasons for low efficiency of the day-to-day scheduling efforts is represented by the problems of organizational interrelations between the stakeholders of the highway cargo transportation business. Generalizations of the road haulage practices together with the outcomes of the investigations carried out by Siberian Automobile and Highway Academy made it possible to identify the groups of interaction problems and the causes in this area. A conceptual approach has been suggested to solve these issues based on such logistical principles as “Just-in-Time” and “Just-in-Sequence”. In line with the developed approach, the article justifies the need to introduce the abovementioned principles to scheduling practices to improve the processes of control and management in haulage sector. Developing and implementing “Just-in-Time” and “Just-in-Sequence” philosophy in transport logistics is of crucial importance, as it is only within such system that the cargo delivery process could be comprehensively controlled. This system improves customer relationships, establishes the company at the market, stabilizes its financial standing, and enhances its competitive advantages. **Applications/Improvements:** The study identifies preconditions and constraints to be taken into account in the course of developing scheduling model for material and information flows in the area of automotive cargo shipments.

Keywords: Consignee, Consignor, Just-in-Sequence, Just-in-Time, Interaction Problems, Motor Transportation

1. Introduction

Drastically intensified and fast developing institutional and technological processes involving numerous changes represent the most important feature of modern times. The time (speed) factor, because of its exclusive significance, has turned into the principal factor of domination in modern economy creating competitive advantages of entrepreneurial businesses and differentiating their revenues¹. Under such circumstances, transport sector has been developing very fast, and the new methods and

technologies have come to help managing transportation systems. Transportation system is a manageable aggregate of people, transport vehicles, buildings and structures interrelated to each other within the framework of the established technological process of haulage.

Sometimes in day-to-day shipment scheduling, the customer requirements to the transportation services, namely, cargo delivery in precisely predetermined time and in precisely predetermined sequence are not met in full that, naturally, impairs the effectiveness of planned and current activities.

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Poor efficiency of day-to-day planning efforts results from the problems of inter-organizational interaction between the participants of the transportation system. In practice, the participants of the transportation system are represented by three links: the 1st link is the consignor or shipper; the 2nd link is the consignee; the 3rd link covers the carrier companies, expediting agents, freight terminals and motor transport companies. Close cooperation between those three links of the transportation system is prerequisite for fulfilling the contracted terms of delivery^{2,3}. Transportation process that is run within the system by transport companies is subject to certain constraints and conditions. Those conditions and constraints can be imposed by either consignor or consignee, and they will be unique for this particular transportation system. The principal requirement is that the system should satisfy the consumer demand for any particular goods in full and on timely basis^{4,5}. It is at the interface among different functional areas that the mainstream and the co-current flows are in need of organized planning and control over the participants involved in the shipping process^{6,7}.

The existing traditional approach to transportation system management (the object of management is represented by the internal indicators of transport subsystem performance) is usually reduced to selecting optimum sequence for increasing the throughput capacity of transport communications in such a way that the costs for transportation are as low as possible. However, in the competitive environment of carrier companies, this approach is not of actual significance as it does not take into account the concerns of transport service consumers^{8,9}.

By contrast to the traditional approach, the object of logistic approach is represented by the result of all activities of all logistics flows. Applying logistic approach helps preserving sustainability of the transportation system. Presently, this approach has been widely applied in haulage practices¹⁰. One of the ways to manage transportation systems is to adapt a system to the current situation. The following adaptation methods are usually distinguished: optimizing the elements of the system; improving the structure of the system; new principles of using the system; developing a new system; changing the application area (activities done within this system). To realize the mechanisms of adaptation, the interaction between all elements of the transportation system is required. Modern market environment sets new tasks for transportation system management and for delivery management

in particular. In shipping process, special attention is paid to the methods of securing cargo deliveries by specified lots (amounts) and in timely manner^{11,12}. As a result, it is now required that the goods should not only be shipped just in time, but also in a specifically predetermined sequence^{13–15}.

¹⁶believes that “introducing the concepts Just-in-Time (JIT) and Just-in-Sequence (JIS) will result in strict adherence to the provisions of the contracts and agreements, in better and faster fulfillment of customer orders, in satisfying their new requirements...”, “...sticking to production schedule, expediting the development of new products and technological processes, boosting companies’ strategy and structure, cutting down the production cycle...”. These concepts imply that the stage of storing inventories should be eliminated, and, consequently, the amount of stock should be minimized.

According to the current practices of the companies show that applying the concepts of “Just-in-Time” and “Just-in-Sequence” will help build a whole transportation system operating based on those principles, both in terms of territory and structure, and thus to improve overall economic efficiency.

Thus, logistic approach is the most appropriate for the purposes of organizing motor shipment process aimed at meeting the requirements to time and sequence of delivery.

2. Method

One of the reasons for the failure to adhere to delivery terms is represented by the problems of inter-organizational interactions between the participants of the delivery system. Close cooperation is the only possible means to secure delivery in time. Transportation process in a haulage company is limited by specific constraints. Those constraints can be stipulated by consignors and by consignees as well, and they will possess specific features intrinsic in this particular system only. As always, the most important of these constraints is the necessity to meet the final consumer’s demand, in time and in full, delivering the goods ordered.

The need to develop and to implement the concepts of “Just-in-Time” and “Just-in-Sequence” in transportation sector of the economy has been identified, as the clients have become focused on having the goods delivered in strictly predetermined time and in strictly predetermined sequence. Depending on the type of the cargo,

the urgency of the delivery could vary. On the consumer side, the basic requirement set to transportation service is that the time related terms of delivery should be strictly observed: the goods should be delivered “Just-in-Time” and “Just-in-Sequence”. Thus, the process of delivering goods abiding by the preset conditions comes to the fore in logistics management.

Today in Russia, a reliable, flexible delivery system responding fast to the new customer requirements remains the exception, rather than the rule.

Presently, different approaches have been applied to solve the tasks of managing and organizing transport process applying logistics principles. Notwithstanding some positive results, the issues of planning transportation process are usually resolved without taking into account the requirements pronounced by the participants of motor transport delivery process. Such logistical concepts as “Just-in-Time” and “Just-in-Sequence” make it possible to meet the customer requirements by developing a good quality schedule.

These concepts are realized based on such principles as lean production, efficient customer feedback, etc. One of the methods of effective management and planning is represented by the combined principle “Lean Six Sigma”. A Six Sigma methodology is focused on customer preferences and requirements to cargo delivery. According to this concept, slow processes are expensive processes. One of the tools of “Lean Six Sigma” method is the concept of “Just-in-Time” delivery. According to “Lean Production” method, major time losses in the course of haulage occur both during transportation and during waiting periods^{17,18}. The consequences of imperfect organization of shipment processes, of suppliers’ negligence, of the communication problems and of underdeveloped stock management processes result in failure to deliver cargo

“Just-in-Time” and “Just-in-Sequence”, which, in turn, can lead to lower quality of logistic service in general, to production downtimes, to reputational losses, etc.

Current importance of developing concepts of “Just-in-Time” and “Just-in-Sequence” in transport logistics is explained not only by the potential to reduce production inventories and all associated costs, but also by the fact that such system can improve company’s customer relations and market positions, its financial stability and its competitive advantages^{19,20}.

3. Results

The results of the undertaken study can be summarized in the conclusions below:

1. The problems of interaction between the processes of transportation and inventory management in the course of cargo delivery have been analyzed;
2. The reasons behind these problems and the implications for the process of cargo delivery have been identified;
3. The existing conditions and constraints have been presented and suggested to be taken into account in the course of developing the model for scheduling material and information flows in the process of cargo delivery.
4. The need to implement logistics principles of “Just-in-Time” and “Just-in-Sequence” in scheduling, planning and organizational practices related to the process of cargo delivery has been justified. Developing and implementing concepts of “Just-in-Time” and “Just-in-Sequence” in transport logistics is of current importance because, in fact, only such system will make the shipment process properly man-

Table 1. Problems of interaction between cargo shipment participants and reasons for these problems

Problems	Reasons
1	2
1. Delay in delivery of the ordered lot	- untimely delivery of cargo for loading (as a result of poorly organized warehouse operators); - longer loading time (if the loading is done manually and no proper loading mechanisms are available); - delay in submitting supporting documents (longer time for obtaining the delivery terms approval); - changing the terms of the order (can result from changes in time of cargo delivery or in the supplied cargo mix); - untimely presenting truck for loading (the carrier has no proper practices of providing trucks for loading)

2. Vehicle delays in wait for cargo handling operations	- no proper time and sequence scheduling (the operations of the company are poorly organized; there is no scheduling department; no established order of vehicle arrivals to loading stations); - insufficient fleet of modern handling equipment with proper capacity and failure to employ state-of-the-art handling techniques (problems of implementing new technologies; no program for renovating loading and handling equipment; insufficient free areas; scarce company budget for purchasing the equipment; equipment downtimes (repairs); - turning a truck into a "wheeled warehouse" in order to apply cross-docking techniques (it is better for a consignee to keep its cargo in a truck than to do handling and storing)
3. Anticipated delivery	- the consignor provides the cargo for loading too early (poorly organized scheduling); - transport operations take less than it is anticipated; - shorter time and smaller number of handling operations (employing more efficient handling equipment and modern technologies); - lower number of transshipment operations
4. Delivering goods that fail to meet order specifications (amount, items)	- the shipper cannot provide the cargo (as a result of the supplier's failure to send the cargo to the consignee); - order mistake (the amounts and the lots of the ordered items could get mixed); - the cargo is lost on the way as a result of natural or other incidents, including organizational practices (one transshipment of coking coal accounts for losing 30% of cargo); - loading mistake (supposing, three packs of green tee were ordered, but, by mistake, one pack of black tee and two packs of green tee have actually been loaded)
5. Failure to ensure regular and sequential shipments	- failure to take into account the throughput capacity of transport infrastructure (as a result of the impossibility to calculate the value, insofar as this parameter is variable and depends on technical and operational performance of the participants of the transportation system); - failure to take into account the conveying capacity of carrier company (poorly organized operations in scheduling department); - changed number of orders with unchanged haulage rate (1st option: annual orders are 1000 tones, order volume is 100 tones, order frequency is 10 times per year; The 2nd option: annual orders are 1000 tones, order volume is 10 tones, order frequency is 100 times per year (thereat, both options will require extra transport resources)
6. Shipment quality problems:	- high cost of delivery (applying modern technologies and equipment that need large investments)
- high tariff problem	
- reliability problem	- untimely delivery (the order does not stipulate the time of delivery); - insufficient safety of cargo (failure to adhere to the terms of transportation depending on the type of the cargo); - high risk (negligent transportation; no cargo insurance); - mismatching working hours of the consignor, consignee, and the carrier (no proper technical interaction, the equipment does not meet the requirements for handling this particular cargo); - low market standing of the participants of the transportation process (sometimes companies fail to fulfill their obligations)
- low flexibility problem	- the company cannot respond to order changes quickly enough (the customer is not allowed to pay by installments)
- end-to-end service problem	- the service does not meet the full range of requirements to delivery (little choice of services, no warehouse available)
- information problem	- unreliable information, the timing of information flow does not correspond to the cargo flow timing (anticipated information, delayed information)
- accessibility problem	- inconvenient ordering, order processing is long (time consuming monitoring of orders; approving specifications and terms); - the shipper is not ready to deliver (the cargo has not been loaded)

ageable. This system will facilitate establishing better customer relations, better reputational and financial standing and better competitive power.

4. Discussion

Since 2008 until 2010 in Siberian Automobile and Highway Academy, the problems of interrelations between the participants of transport process running in the transportation systems have been investigated²¹. Investigations covered more than 220 companies, leading Russian manufacturers, retailers and transport service providers.

Summarizing the practices of interrelations between the participants of motor shipment process²² and applying the results of the studies developed by Siberian Automobile

and Highway Academy made it possible to identify the problems of interaction and their root causes (Table 1).

Problems of inter-organizational interactions result in the failure to meet one or several customer requirements to the transport services that ultimately leads to renegeing on one's contractual obligations to deliver the goods in full.

Table 2 shows the examples of the consequences coming as a result of the discovered problems of inter-organizational interaction.

Traditional notion of "ideal" operation of the transportation system implies the key notions of regularity and continuity. However, competitive environment in modern market of transport services makes a service supplier respond to the emerging requirements and to meet the

Table 2. Consequences of the problems of interaction between cargo shipment participants

Problems	Consequences
1	2
Delay in delivery of the ordered lot	- problems in consignee's operations; - higher number of the orders the carrier failed to deliver; - reputational losses.
Vehicle delays while pending cargo handling operations	- increased transportation costs; - lost orders; - the lack of proper regulations result in longer waiting times and in lower throughput capacity of the handling hub; - delays while pending loading result in longer delivery times and in failure to present truck for unloading in due time.
Anticipated delivery	- increased inventory stock at customer warehouse; - delay while pending unloading.
Delivering goods that fail to meet order specifications (amount, items)	- production downtimes may occur if the order is not delivered in full; - the stock at customer warehouse may increase if the delivered amount exceeds the ordered amount.
Failure to ensure regular and sequential shipments	- incorrect scheduling; - operational problems for all participants of cargo shipment process.
Shipment quality problems: - high tariff problem	- high shipment tariffs stipulate the higher price of goods, and affect their competitive power on the market.
- reliability problem	- untimely cargo delivery causes damage to the client; - extra expenditures for storing spare inventory stock for consignors and consignees; - as a result of incorrect storekeeping, negligence in performing loading and unloading operations, the cargo may be damaged, sent to wrong address, stolen.
- low flexibility problem	- lost orders
- end-to-end service problem	- a failure to provide the required complex of services leads to losing clients.
- information problem	- no certainty about the deliveries; - no possibility to change the terms of delivery.
- accessibility problem	- poor competitive advantages of the carrier company in the sphere of transport services; - lost orders; - reputational losses.

demand as fast as possible. To organize delivery process in an efficient way, all transport operations have to be scheduled in time and in space.

Only when the interaction and cooperation between the participants of motor shipment process are well established and continuously maintained, it becomes possible to abide by such principles as “Just-in-Time” and “Just-in-Sequence”^{23–25}.

5. Conclusion

In highly competitive environment, the need to adjust to the interests of the clients makes carrier companies react fast. This, in turn, results in better quality of services, in minimizing delays in the course of fulfilling the orders and in strict adherence to the mutually approved delivery schedule. The process of fulfilling the orders should be taken into consideration first and foremost. Today, many concepts of cargo delivery gained popularity: “Just-in-Time”, “Just-in-Sequence”, “door-to-door” etc.

Given ever-growing competitive struggle, the suppliers try to take into account all requirements and all constraints of the customers in terms of cargo delivery. Today, principal conditions are “Just-in-Time” and “Just-in-Sequence”. For example, delivery of the component parts to a vehicle assembly line should by all means be performed applying concepts “Just-in-Time” and “Just-in-Sequence”, because the orders are issued strictly based on the current needs of the plant (amount, items) at this particular moment.

Failure to adhere to the terms of delivery affects not just the operational results of the manufacturer, but also the performance of all its contractors and partners.

Delivering goods “Just-in-Time” and “Just-in-Sequence” at the lowest possible costs of material and transportation resources are the key principles of transport logistics.

6. Acknowledgement

The study has been carried out under the financial support of Russian Humanitarian Science Foundation in Omsk region within the framework of scientific project No. 16-12-55016.

7. References

1. Biryukov VV, Romanenko EV, Khairova SM, Khairov BG. Cyclic-temporal competitive advantages of the

- national economy and entrepreneurship development. *Mediterranean Journal of Social Sciences*. 2015; 6(4):64–71.
2. Sergeev VI, Belov BL, Dybskaya VV. *Corporate logistics. 300 answers to the questions of professionals*. Moscow, Infra-M Publishing house; 2005.
3. Mirotin LB. *The efficiency of logistics management*. Moscow, Publishing House Exam; 2014.
4. Lazarev AA, Gafarov ER. *Theory schedules. The tasks and algorithms*. Moscow, Publishing House Exam; 2011.
5. Waters D. *Logistics. Supply chain management: translated from English. Series of Foreign textbook*. Moscow, Publishing House of UNITY-DANA; 2003.
6. Ivanov DA. *Supply chain management*. St. Petersburg, Publishing house of the Polytechnic University; 2009.
7. Mirotin LB. *Transport logistics: textbook for high schools transport*. Moscow, Publishing House Exam; 2002.
8. Artamonov PV, Pogulyaeva IV. *Problems of implementation of logistics technology just in time with the long-distance transport in Russia. Proceedings of the international scientific-practical conference Development of traffic and building complexes and development of strategically important territories of Siberia and the Arctic: the contribution of science*; 2014. p. 31–4.
9. Lagutin AE, Pogulyaeva IV. *The logistical problems of application of the provisions in the distribution of the finished product. Integrated Logistics*. 2011; 3:35–6.
10. Galaburda VG, Persianov VA, Timoshin AA. *Integrated transportation system: a textbook for high schools*. Moscow, Transport; 1996.
11. Mochalin SM, Tyukina LV. *Identification of the supply chain in the automotive industry. Automotive*. 2015; 1:2–4.
12. Savin VI. *Transportation of goods by road. Reference Manual. 2nd edition, revised and supplemented*. Moscow, Business and Service Publishing House; 2014.
13. Mochalin SM, Tyukina LV. *Features of the application of the principles of logistics in organizing the cargo delivery by road. Bulletin of SibADI*. 2014; 1:20–4.
14. Lukinskiy V, Lukinsky V, Churilov R. *Problems of the supply chain reliability evaluation. Transport and Telecommunication*. 2014; 15(2):120–29.
15. Lukinskiy V, Lukinsky V, Zamaletdinova DA. *The transport-logistics operations performance evaluation in supply chain. The 1st International Workshop on Innovation for Logistics, Italy: Logistica Ricerca e Sviluppo*; 2013. p. 15–20.
16. Mirotin LB, Sergeev VI. *Fundamentals of logistics: tutorial*. Moscow, Infra-M Publishing House; 2000.
17. George M. *Lean six sigma. Trans. from English. 3rd Ed*. Moscow, Alpina Business Books; 2007.
18. Sergeev VI. *Supply chain management: a textbook for undergraduates and masters*. Moscow, Publisher Yurayt; 2014.
19. Novikova TV, Radionova VA. *The development of models for assessing the competitiveness of supply chains. Bulletin*

- of the North-Caucasian Institute of Humanities. 2016; 1:125–35.
20. Novikova TV. Mobility logistics technologies in an increasingly innovative orientation of enterprises. Collection of Materials of the International Scientific-practical Conference the Architecture, Construction, Transport, Omsk: SibADI; 2015. p. 1125–29.
21. Lukinskiy V, Lukinsky V. Formation of failure models for the evaluation of the reliability of supply chains. *Transport and Telecommunication*. 2015; 16(1):40–7.
22. Belyaev VM, Fadeeva EY. Problems of supply chain management and ways to overcome them. *Integrated Logistics. Scientific Information Journal*. 2012; 3:18–20.
23. Bespalov RS. *Transport logistics. Latest technology of building an effective delivery system*. Moscow, Publishing house Peak; 2007.
24. Popkov T, Garifullin M. Optimization of supply chain: transport networks: site XJ Technologies [Internet]. [Cited 2014 Dec 19]. Available from: <http://www.xjtek.ru>.
25. Mochalin SM, Tyukina LV. Operational management of freight transport logistics flows of the company. *Proceedings of the International Scientific and Practical Conference. V. 2. Collection: Basic Science and Technology - promising developments*, North Charleston: USA; 2015 Feb 24–25.