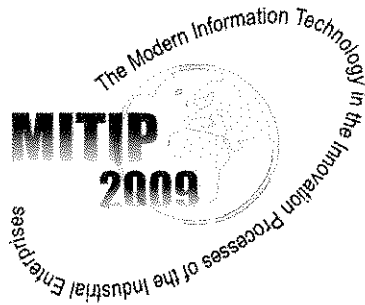The Modern Information Technology in the Innovation Processes of the Industrial Enterprises

MITIP 2009

Conference Proceedings

Editors:

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PROCEEDINGS

11th International Conference on the

Modern Information Technology
in the Innovation Processes
of the Industrial Enterprises

15-16 October 2009

Bergamo – Italy

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CONCEPT FOR AN ADAPTABLE OPERATIVE TRANSPORT PLANNING IN THE AUTOMOTIVE INDUSTRY

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Abstract:

Volatility represents a big challenge for logistics in the automotive industry as it becomes harder for the transport planning to bring the demands efficiently to the automobile manufacturer. The reason for volatility results from casual incoming orders on one side, and the middle- and long-term changes, which appear from volatilities in production or demand, on the other side. The concept of an adaptive short-termed transport planning focuses on an optimization of transports on the actual situation despite of volatility. Through this it will be possible to counteract an insufficient workload in a combination with sluggishness of the transport planning.

Keywords:

Logistics, automotive, transportation planning, inbound, adaptability

1. INTRODUCTION

In the course of the international research project InTerTrans a practicable concept for the transport planning and the scheduling should be developed. The German Federal Ministry of Economics and Technology and the Austrian Research Promotion Agency funded this project with the partners 4flow AG, Fraunhofer IML, Schenker AG, the Vienna University of Technology and Volkswagen AG. One approach to raise the efficiency of transports is the implementation of a middle-termed transport planning. Based on these findings the concept of an adaptable operative transport planning should be deducted.

In recent years the trend in the automotive industry of individuality of customers and decreasing product life cycle was confirmed [1]. This yielded to an increasing amount of product variants and models as well as frequent start-ups and run-outs in the factories [2][3][4]. Thus their impact appears in particular unsteady transport loads because of low supply and transport lots [5]. As well velocities in the sequence within the production level which occurs through technological factors (e.g. blocking of colors in the paint shop) or trends, flops or crises on the global level play a decisive role [4][5]. In today's supplier logistics of the automotive industry most of the parts will be transported by the expensive transport concept of the area forwarder because of the volatility [6]. Therefore the Original Equipment Manufacturer (OEM) hands the risk of a high workload over to the service provider. Suppliers with higher volumes supply the OEM with a direct relation where the risk

is at the side of the OEM. Analysis within InTerTrans it appears that inefficiencies at transports are caused by small supply volumes. On one side suppliers with the area forwarding concept possess very high volumes, on the others suppliers with direct relations possess small volumes, which are adapted to a high work load. This leads to high inventory costs at the OEM. Moreover the transport concept milkrun is applied very rarely.

Because of short-termed volatility in the supplier logistics an adaptable operative transport planning leads to an increase of efficiency. The emerging benefit is having the optimal transport concept at any time which leads to low transportation and inventory costs. A complete smoothing of supply demands is not possible, due to the assumption that volatility in the automotive industry will be present at every time (figure 1).
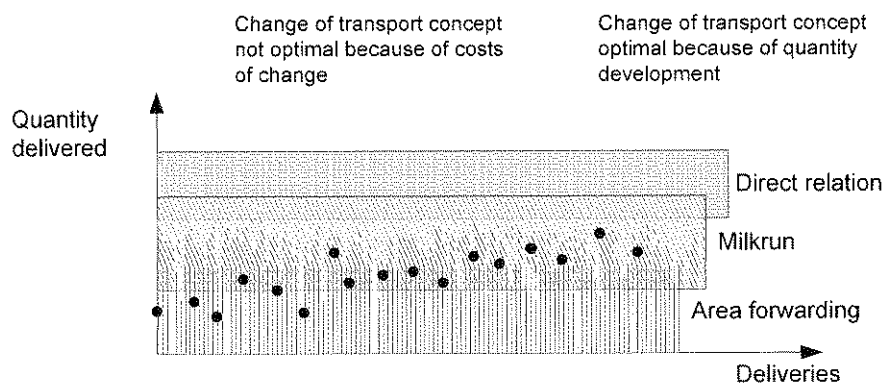
Figure 1: Adjustment of transport concepts to actual supply demands

2. CHALLENGE OF TRANSPORT PLANNING

The task of the transport planning is to design the transport network and control the therein executed transport processes. In detail the planning is defined through the following temporal segments [6]:

- Design of transport network (long-term)

- Planning of transport routes and means of transports (middle-term)

- Planning of vehicle usages (middle and short-term)

When designing the transport network supplier locations as well as their estimated supply behavior have to be taken into account. In the course of configuration, every supplier will get assigned a transport concept which is optimal in as a whole for the OEM. Nowadays in the automotive industry direct transports, area forwarding, milkruns, forwarding warehouse and supplier settlements near the production of the customers are applied. The result is the determination of the amount of warehouse locations and hubs as well as transport relations. In the middle-termed transport planning the transport routes have to be planned based on the expected demands. In connection with the concept of area forwarding not only the catchment area of a transition point for the supply pipe is important but also the control of the main pipe. Within an outsourcing the service provider has to be involved. Because of internal arrangements, like announcements or adoptions, lead-times must be provided for an operative assignment.

After defining structure and means of transports the use of vehicles has to be planned. Here

is the task to assign the transport orders to several vehicles. Using the concept of area forwarding and direct relations an excess planning is followed by an event. For instance, in the area forwarding concept an excess planning is initiated when a new supplier is integrated or an old one is dropped.

Because of middle-termed adaption much potential in the transport planning are unused. Through the possibility of planning transports within low lead-times, these potentials will be used to reduce costs and increase the efficiency. A concept for a short-termed transport planning is the adaptable operative transport planning.

3. CONCEPT FOR AN ADAPTABLE OPERATIVE TRANSPORT PLANNING IN THE AUTOMOTIVE INDUSTRY

In literature an adaptable system is understood as the ability of a system to modify the structure of an established system in a quick and sustainable way. This criterion tops the flexibility, which only allows a transformation of a defined area [7]. By converting this definition into a concept of an adaptable operative transport planning, the resources of transport planning should be attached at their optimal operating point. As result volatility in demand will have only minor effects – depends on the possibility to reduce the lead-time in planning – on the work load efficiency of transports. To assure the adaptability of processes these processes have to be transformed and enhanced by the factors transparency, flexibility and standards.

For the development of a concept, which is applied in the short-term planning, the transport planning has to be analyzed and optimized in a holistic focus. Due to the fact that transport planning covers a wide area, the concept will concentrate on the following fields:

- Due to an european statistic the **road** is with 76.5% of all ton-kilometers one of the most important carriers [8]. Especially the criterion flexibility is strongly pronounced [9]. Because of the high relevance for the European freight transport the concept is focusing on road traffic.

- Supply concepts are describing the logical aspect of a delivery. This implies that the information content plays an important role. Within the supply concepts there must be a clear defined information interface between the supplier and the OEM to avoid cost-incurring incidents. These can either be total production stops, when goods aren't received in time, an unintential stock or accumulations of material in buffers. Hence for a short-term excess planning short and standardized information flow are required. This allows that processes can be passed through fast and efficiently.

  Because of time and quantitative criteria there is a cause-effect between supply concepts and transport concepts (figure 2). Due to the fact that **single-stage warehousing** constitutes the most complex case – because of possible application to all transport concepts – it will be the focus of this concept.

	Double-stage warehousing	Single-stage warehousing	Just-In-Time	Just-In-Sequence
Direct relation		●	●	●
Milkrun	O	●	●	O
Area forwarding	●	●	O	

O not usual
● praxis

Figure 2: Connection between supplier concepts and transport concepts, according to [10]

On closer examinations of transport concepts the lead time of several characteristics, which is needed for an operative use, is an important criterion for the short-termed change of transport concepts. The lead time consists of the following points:

- Adjustment of contractual arrangements between OEM and the service provider (agreement of validity, volumes, frequencies, capacities, etc.)

- Planning of new relations (definition of routes, loading plans, order, unloading place, matching with supplier, emergency plan, etc.)

In the following these elements for an adaptable operative transport planning will be adapted.

3.1. Contractual Agreement

In terms of adaptability the contractual agreement plays an essential role. The internal system of rules of an OEM (need of an announcement, amount of proposals, voting's, etc.) configures a certain lead time. Hereby the industry aims at standardization to increase the transparency of bidders which provide to reduce the votings and misunderstandings in a process [7]. In reference to the internal system of rules adaptations can also be accomplished. A frame contract which is based on adaptability would be a possibility to reduce lead times, because the requests for proposals are arranged in advance. Adaptations of contracts could be made continuously. The following concepts could be conceivable:

- Frame contracts with a service provider who covers all transports in a defined region. Hereby the service provider uses every possible transport concept. Through an „internal" adaptation of the service provider's transport network the lead time of optimization will be reduced. The result is a high degree of flexibility.

- Flexible frame contracts with more service providers. The service provider guarantees the OEM with these frame contracts a defined amount of resources. To sustain the large volumes at the concept of area forwarding only one service provider is contracted. The allocation of all other transports, realized with milkruns and direct relations, are based on specific rules. These logistic service providers have flexible frame contracts. Now the OEM has the possibility to assign the volumes to the service provider in a flexible and fast way.

3.2. Planning of new relations

To act fast and efficient in planning of new relations, a structured process is a basic criterion. This can be assured through a methodological approach and standardization. Short lead times in planning and the reduction of failures, because of equal running processes, are the results.

The reactivity of a system concerning the planning and controlling plays an important role in the operative transport planning. Hereby a profound information transparency over the whole supply chain is relevant. An early integration of stake holders in possible decisions of the OEM constitutes an important criterion for adaptability. Continuous reportings describe a possibility to realize adaptability, as well as an IT network with all the relevant data of the stake holders. Through this, certain preparatory work can be assured before a decision is taken. Preparatory work can be cost appraisals or evaluation of possible scenarios.

Current processes in transport planning show that there is no continuous adjustment of the transport network. An information transparency is missing well. In case of an adaptation new contracts are prepared which leads to high lead times (figure 3).
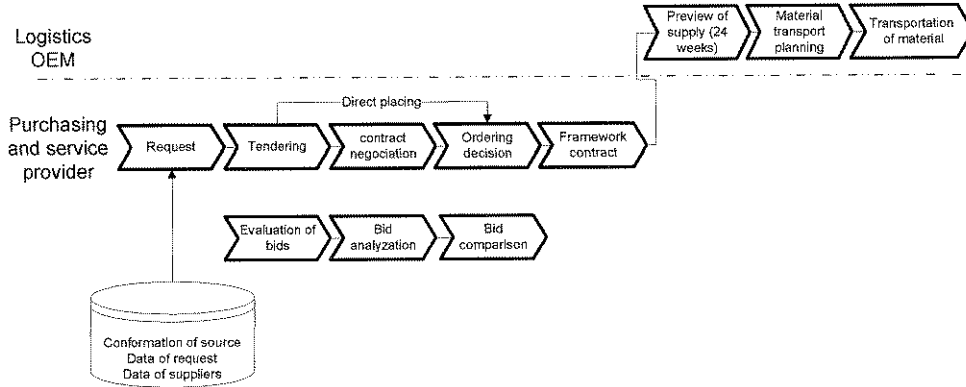
Figure 3: Actual transport planning processes in the automotive industry

To optimize the current planning processes, these have to be modified in the way of ensuring information flow and integration of the stake holders. This should raise the transparency and avoid double work. In order to farther reduce the lead time of planning processes, a methodic structure is very important. Processes should be standardized and expanded with IT-tools (automatical creation and evaluation of scenarios, generation of loading plans, etc.) to reduce additional work. Furthermore continuous processes have to be established and the transfer of information has to be pushed. These are basics of adaptability (figure 4).

Figure 4: Process of an adaptable operative transport planning

4. CONCLUSIONS

An adaptable operative transport planning enables an increase of efficiency of transport planning because of the continuously adaptation of the transport network on actual conditions. The target of this concept is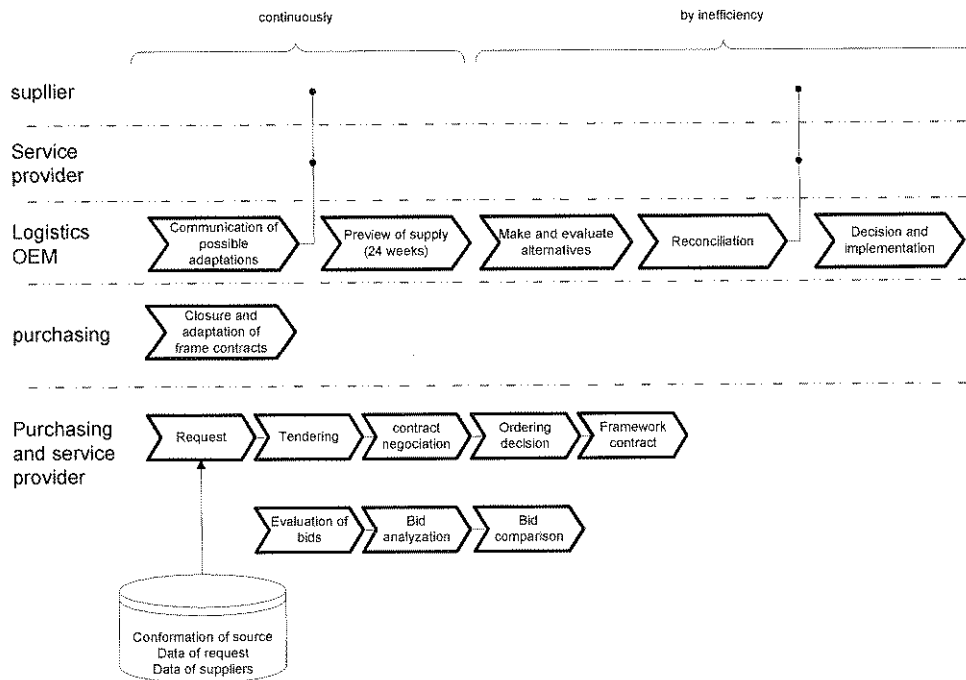 the adaptation of transport concepts in the short-term range. For the implementation an adaptable operative transport planning a high information transparency and new contract models are an essential requirement. Furthermore the processes in the transport planning have to be expanded by the attributes transparency, flexibility and standards.

The results of an adaptable operative transport planning are efficiently used and fully loaded transports at any time, as well as the reduction of transport and inventory costs.

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