

NEW TRENDS AND CHALLENGES IN AUTOMOTIVE INDUSTRY LOGISTICS OPERATIONS

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Abstract: This paper lays out the main features of the global automotive industry and identifies several important trends. Logistics operations (inbound and outbound) in the automotive supply chain are complex and account for large expenses and therefore are segments in the value chain where improvements can be made. Better coordination between inbound and outbound logistics contributes to optimising the supply chains, to reducing inventories and to responding to consumer requests. As economies grow, the competition shifts towards brand image and customisation and here the speed and reliability of logistics operations becomes a critical elements.

1 Introduction

Logistics is the collection of activities associated with acquiring, moving, storing and delivering supply chain commodities (i.e., products in all stages of manufacture, service and information). Logistics encompasses the business functions of transportation, distribution, warehousing, material handling and inventory management, and interfaces closely with manufacturing [3].

There are four levels of manufacturing logistics systems:

- Production Unit,
- Supply Chain,
- Production Facility,
- Enterprise.

An enterprise is a business entity that consists of multiple manufacturing plants as well as other aspects of the business such as design, engineering, marketing, and sales. Also, practical logistics problems are at enterprise level [3].

For the products such as automobiles, which feature multiple products, technologies, and process the supply chain becomes more complicated. The material planning, and logistics supply chain for an automotive company is shown in the Fig. 1, which illustrates the complexity of the chain, spanning from automotive dealers back through multiple levels or tiers of suppliers. The automotive company's supplier network includes the thousands of firms that provide items ranging from raw materials, such as steel and plastics, to complex assemblies, such as transmissions, brakes, and engines.

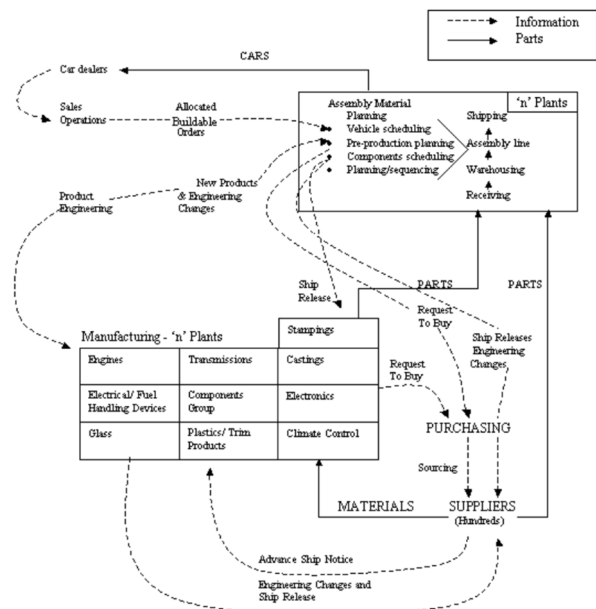


Figure 1: Automotive supply chain [3]

2 Automotive logistic process

Automotive logistics is entity flow of automotive producer's raw materials, components, vehicle and spare parts on steps of automotive purchase, production, sales (Fig.2). Automotive logistics include inbound logistics of raw materials and components, garage logistics of production process, sales logistics of vehicle and spare parts logistics, that is including object purchasing, transportation, storage, loading and unloading, distribution processing delivery and information processing. In macro way, Logistics includes recycle of waste as well [4].

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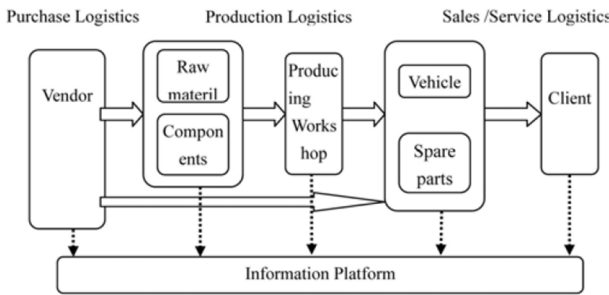


Figure 2: Automotive logistic process

Automotive Logistics is an important composing part of automotive enterprises, and also is a logistic activity with highly complex degree in logistics industry. Comparing to other logistic activities, Automotive Logistics have characteristics of capital-intensive, technology intensive and knowledge intensive [6]. With rapid development of our automotive industry and fierceness of competition of automotive market after entering WTO, Automotive Logistics must play a much more important role in automotive industry, and reduction of automotive cost [7].

3 Major trends in logistics

Today’s global logistics environment is characterized by increasing complexity and a number of important parameters shaping the global environment. The speed of change of these parameters is breathtaking and is driving increasing complexity in the logistics ecosystem. We have labeled these changes as “trends”, in that they continue to re-shape the logistics landscape, and provide a shifting set of environmental risks and limitations that either constrain decisions, or alternatively present opportunities which nimble enterprises are able to exploit quickly.

There are possible identify the major trends that are impacting organizations, and follow up with some of the key strategies that successful organizations are applying to cope with or even exploit these trends. The graph shown in Figure 3 shows the importance of identified top trends identified by global executives surveyed in all countries, as well as their relative importance in the next five years. They are shown in chronological order from most important to least important [2].

Several trends demonstrate that a number of major challenges lie ahead, as the world becomes a more complex place to operate logistically [2].

Customer expectations: In essence, logistics and supply chain management should primarily enable a company to satisfy its customers’ needs. The most important trends is increasing customer expectations and meeting customer requirements, the number-one logistics objective. But, as customers are becoming ever more demanding and critical, traditional measures often fail when pursuing strategies to satisfy customers.

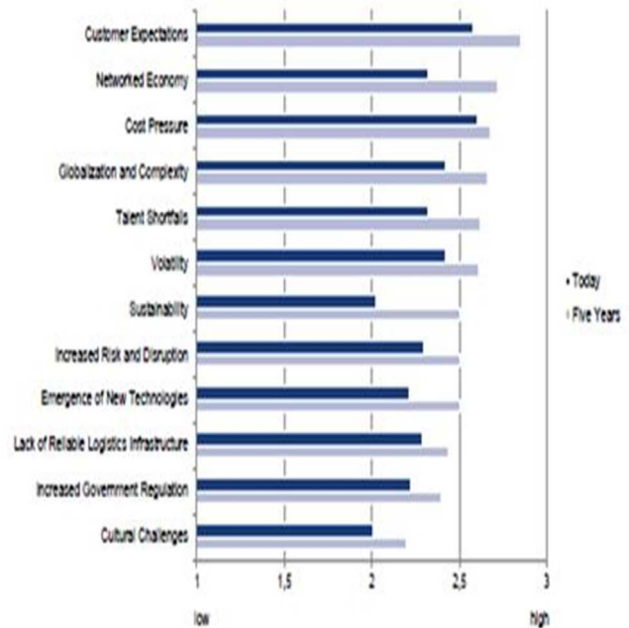


Fig.3: Importance of Logistics Trends

Networked economy: Companies are often forced to collaborate with partners both vertically and horizontally in their extended supply chain network, and these partners expect them to integrate their processes and systems. Companies are forced to adopt network thinking rather than company thinking.

Cost pressure: Logistics costs are playing an important role in reducing overall costs. Logistics costs share of overall revenue is as low as 4% and 6% in the electronics and automotive industries, respectively. The costs are on the rise (larger than 8% on average for manufacturing industries). About 14% of the enterprises cannot estimate their logistics costs.

Globalization: Two thirds of company’s logistics capability is negatively influenced by poor transportation infrastructure, which is a problem particularly in emerging markets. In sum, globalization clearly amplifies other trends and leads to an increase in complexity, particularly in regions of growth such as Russia, Eastern Europe, India, and Africa.

Talent shortfalls: The most important strategies to cope with talent shortage are training and qualification programs and strategic cooperation with universities and research institutions. In the United States and Europe, talent shortages are also a function of demographics. In emerging nations strong competition from other fields like finance, strategy and IT contributes to the talent shortage.

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Volatility: In the last years, market turbulence on the supply and demand side has increased. This was amplified by the economic and financial crisis, which demonstrated how fluctuations in one part of the world can build up to dramatic problems in other parts of the world. Volatility factor will continue to increase and more than 50% companies consider it to be a very important trend in five years.

Sustainability pressure: This trend has emerged as a very serious topic. Today more than 55% of the companies stated that green issues are part of their logistics strategy. However, there remains a great deal of uncertainty in the deployment of these strategies, especially relative to measurement systems, evaluation and setting goals and strategies for logistics sustainability.

Increased risk and disruption: The majority of companies (irrespective of size, sector, country and position in the supply chain) consider the mitigation of internal and external risks essential. Strategies for managing risk around demand and planning are also considered important. Solutions focused on improving transparency of tier two suppliers, inventory and demand impede mitigation and force companies into reactive strategies. Proactive strategies should include research and development, procurement, production and sales.

New technology: The majority of companies are recognizing the growing need for investments in new technology, with about 60% of the companies planning to invest in “big data” analysis tools within the next five years. Those tools seek to develop capabilities around the comprehensive handling and intelligent connection of data to increase planning and control outcomes.

4 Transport logistic and supply chains

The development of trade networks creates various needs for value-added logistics management and gives rise to a large number of individual trends in logistics and supply chains [1].

Restructuring of logistical systems

Manufacturers are restructuring their logistics systems by concentrating production and inventory capacity in fewer locations. Concentrating production capacity enables companies to maximise economies of scale in production at the expense of making their logistics system more transportintensive and lengthening lead-time to customers. Inventory centralisation, which has been a long-term trend, is now occurring on a larger geographical scale. Companies have been able to enjoy the inventory cost savings, while minimising additional transport costs by geographically separating stockholding and break-bulk operations, with the former becoming more centralised while the latter remains decentralised.

Centralisation has also occurred in parcel and mail delivery systems by configuring their logistics systems to “hub-satellite” systems in which all but local traffic passes through a centralised sorting system.

Realignment of supply chains

Companies are realigning their supply chains. In many sectors, companies have been concentrating on core competencies and sub-contracting non-core, ancillary activities to outside contractors. Vertical disintegration of production is adding extra links to the supply chain and increasing the transport intensity of the production process. At the same time, companies have steadily expanded the geographical scale of their sourcing and distribution operations. Also, in order to overcome the tension between centralised production and product customisation, companies are centralising the core production of standard products, often in countries with low labour costs, and delaying their customisation until products reach their regional markets. The number of stock keeping units is minimised until the point of customisation, thus minimising inventory risk and costs, and reducing lead-times.

Rescheduling of product flow

Product flow in the supply chain is increasingly time-compressed. The lengthened supply chains are now under pressure to compress order lead-times (time elapsing from the placing of an order to the delivery of goods) in order to be competitive in a foreign market. There seems to be a variation of lead-times, which can be attributed to differences in trading practices, degree of retail concentration, level of ICT support and size of the country. Time compression of product flow can save inventory costs, enable companies to respond more rapidly to shorter life cycles of products as well as variations in demand, and increase reliability of delivery. One way of rescheduling freight movement is by operating nominated-day delivery to customers and introducing timed-delivery at factories.

Refinement of transport and warehousing management

Transport and warehousing management is refined by optimal use of different transport modes and by the increasing use of Information and Communication Technology (ICT). For example, selective use of international transportation modes is now common in the personal computer industry, in which parts are transported either by air or sea, depending on the degree of added value. Items with low added values are normally carried by sea in order to reduce transportation costs, whereas key parts with higher added values are selected according to demand shifts and transported by air immediately prior to assembly. This enables manufacturers to maintain the quality of parts used in finished products, ensure

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consumer satisfaction, and at the same time eliminate the risk of declines in the price of product inventory.

Changes in product design

An increase in complexity and sophistication of products will lead to more value added per unit of weight, especially with final products. Increase in Internet sales is converting the direct delivery of CDs, tapes, videos and software into electronic distribution. Opportunities also lie with regard to the integration of logistics and transport implications at an early stage of product design: integrated product design. For example, the participation of the packaging industry and other supply chain actors. Standardisation and the implications for (reverse) logistics (storage, handling, transport etc.) can be taken into account. For example, this could entail the collection of clean waste (i.e. packaging) from retail outlets by the same vehicles used for product distribution.

Integration of logistics

As industrial activities extend globally, logistics will involve more material and information flows throughout a supply chain from sources to customers, which extends beyond national borders. In restructuring supply chains, logistics need to be managed as an integrated process that seeks to optimise these flows. If all firms involved in a particular supply chain optimise their logistics systems independently of other firms in that chain, the management of flows across the whole chain is likely to be sub-optimal. Integrated logistics attempts to overcome this problem. This concept of integrated logistics extends functional management to include customers, suppliers and manufacturers. Companies can no longer afford to focus on supply-side efficiency alone, they need to use their business strategy to drive them towards integration of their demand and supply sides to build a platform for achieving a competitive advantage. This involves the complete set of activities and organisations relevant to production and distribution, as well as their connecting supply links. It suggests an underlying structure of activities operating within a process of material and product flow. Decisions made in each area impact others so that it becomes a single, interdependent system.

Outsourcing of logistics activities

The need for outsourcing - Efficient logistic activities are indispensable to effective business operations. Therefore, companies that perform these necessary functions exceptionally well are, in multiple ways, adding genuine value to the business operations.

Third party logistics (3PL) - Logistics activities are often outsourced by manufacturers to Third Party Logistics operators (3PL). These operators have greater expertise, which enables increased flexibility of logistic operations to cover wider geographical areas, with lower operating costs and better quality of service. The externalisation of logistical services has been a two dimensional process, with firms increasing both the range

of services that they source externally and the volume of traffic entrusted to the third party. Companies have been increasingly demanding an integrated logistics service tailored to their requirements. The best third party providers understand the strategic importance of logistics management, and position themselves to provide more and better services that overcome their client's concerns about relinquishing control of their key competency.

Fourth party logistics (4PL) - Fourth Party Logistics (4PL), a new concept in logistics outsourcing, is emerging as a path to surpass one-time operating cost reductions and asset transfer of a traditional outsourcing arrangement. A 4PL provider is a supply chain integrator that assembles and manages the resources, capabilities, and technology of its own organisation with those of complementary service providers to deliver a comprehensive supply chain solution. Central to the 4PL's success is a "best of breed" approach, which is to integrate the client's supply chain activities and supporting technologies across alliances between the best third party service providers, technology providers and management consultants, thereby creating unique and comprehensive logistics solutions that cannot be achieved by any single provider. The development of 4PL's solutions leverage the capabilities of transport operators, technology service providers, and business process managers to deliver a comprehensive supply chain solution through a centralised point of contact.

5 LEAN Logistic modes

In view of the problems existing in our automotive logistics, in order to accelerate the development of automotive logistics industry and meet the requirements of logistics service well, the automotive industry has to break current mode and build a new comprehensive logistics mode as the development of time, realizing the manufacture and logistics mainly based on customers-oriented, which refers to build JIT co-delivery and Lean logistics mode based on E-business platform. (fig.4)

This mode is following the fashion of E-business development, automotive enterprises use advanced information technology to build E-business platform, realizing sharing information with third party Logistics Company, cooperation enterprises and clients, coordinate logistics operation. What's more, in order to increase the logistics operation rate and implement automotive lean manufacture, the enterprises need reduce the cost by carrying out JIT coordinate delivery and lean logistics, and realize logistics operation on time, by meeting the requirement of quality and quantity. To connect each step in logistics into a organic integrity and carry it on, which makes the whole logistics operation process become a value chain of non value added activity, and realize highly effective logistics operation [4].

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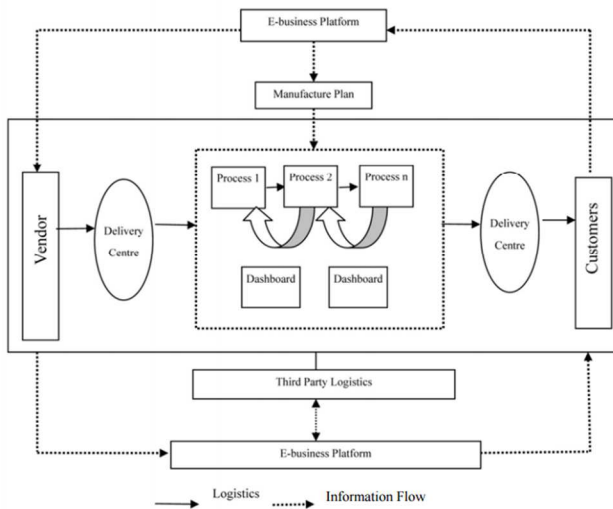


Figure 4: JIT co-delivery and Lean logistics mode based on E-business platform [4]

Through this operation mode, automotive enterprises, third party logistics company and clients can do the logistics information inquiry and communication by E-business platform, which realize follow-up service of logistics operation. And the enterprises carry out JIT manufacture and purchase by customer-oriented, realize zero inventory operation, remove non value added activity in logistics operation, which reduce logistics operation cost dramatically and improve logistics operation efficiency.

Conclusions

Adaptable and flexible logistics systems and networks have the highest absolute potential for innovation within logistics from the participants’ point of view. In particular, cooperation across the value chain is regarded as crucial for the realization of improvement potentials. Virtual reality (such as for digital plant planning) and automated control (e.g. by agent systems, RFID etc.) are seen as the most important growth areas for innovations. The key barriers for virtual reality, however, include insufficient degree of detail and reusability of models.

According to logistics study of Roland Berger, [5] logistics is a dynamic market impacted by a number of key trends. Main trends and their impact on logistic with an appropriate measure of relevance is summarized on the figure 5. The most important trends that affect logistics is new technologies and outsourcing with cost pressure, and trend that affect at least is sustainability.

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Trend	Relevance	Impact on Logistics
1 New Technologies		> Growth in new technology investments (e.g. RFID, inventory, automation) > Integrated logistics networks and real-time tracking of transportation value chains > New business models based on data mining/analytics
2 Outsourcing/ Cost Pressure		> Continued cost pressure on supply chain operations > Forward/backward integration of players in the supply chain > Reshaping of logistics hubs, less complex than of manufacturing footprint
3 E-Commerce & Digitalization		> New structures in the supply chain (e.g. bypassing of hubs, direct ordering, transparency) > Demand for value added services on B2B and B2C level (e.g. packaging, return deliveries) > Refinement of service levels (e.g. same day delivery, utmost flexibility)
4 Demographic Change/ Urbanization		> New logistical requirements in inner-city transportation and long-distance transportation (e.g. innovative approaches to first and last mile transportation) > Need for better utilization of both infrastructures and fleets (e.g. pooling, use of non-logistics infrastructure)
5 Globalization of Operations		> Increasing logistics process complexity of global supply chains > New approaches of supply chain risk management > Greater exposure to unusual interruptions and disruptions of business processes
6 Regulatory developments		> Traffic gridlocks result in stricter regulations for urban transportation (e.g. tolls, bans) > Understanding and management of tariff and tax regulations becomes increasingly decisive, particularly in Russia, India, Argentina (e.g. local content)
7 Sustainability		> Establishment of green standards across the entire supply chain (mainly driven by industry players) > Use of more efficient vehicles, hybrids and alternative fuels

Figure 5: Megatrends and impact on logistics [8]

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Review process

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