The logic of future logistics

E. Djabarian & G. Mattrisch
DaimlerChrysler "Society and Technology" Research Group
Berlin/Palo Alto

Abstract

This paper describes trends and developments in international transportation and logistics. Key driving forces are pointed out, and the research methodology is shown. Selected results with regards to technical, organizational, and commercial aspects are discussed and transferred into a future scenario of the international logistics business.

1. Introduction

The situation of urban transport and the environment is increasingly affected by the volume, quality, and performance of freight transport. This statement is valid nearly all over the world, and it will be valid for the next decade, at least.

Concerning Western and Central Europe, future volumes are widely known: PROGNOS forecasts 2.476 billion tkm in 17 Western European countries by 2010 (1998: 1.791), and 298 billion tkm in some five Eastern European states (1998:226) (1). This is an increase of of ca. 40% within a decade, including a modal shift towards road transport from 79 to 80% (Western Europe) or 55 to 72% (Eastern Europe) respectively. Experts in the field are estimating that these forecasts – both volumes and modal split figures – might be somewhat conservative (2), describing rather a slow growth scenario. Anyway, as there should be no doubt in these projections, we can focus on the question of potential structural, processural, and organizational changes of goods transports within the next decade, and in this way bringing the term "logistics" to the forefront.

The other side of the coin: Internet and Internationalization are Mega-driving forces in many business fields, automotive industry being affected to a very high degree. Buzzwords such as global sourcing, just-in-time, time-to-market, internet-based
business-to-customer relations (B2C) might be well known to the public, but rarely reflect their impact on comprehensive production concepts and underlying logistic requirements. Two recent examples of how DaimlerChrysler is acting in that context:

- October 2000: Following approval by antitrust authorities in Germany and the U.S., DaimlerChrysler, Ford, GM and Renault/Nissan have now launched one of the most important B2B platforms ever. Covisint, the largest Internet marketplace in the world, is designed to create a universal and unified network with suppliers to the automotive industry.

- December 2000: DaimlerChrysler invests 125 million Euro in Global Logistics Center. DaimlerChrysler will invest about 125 million Euro until 2005 in the Global Logistic Center in Germersheim. In the course of this 200 new vacancies will be created. The reason for this investment: The Mercedes-Benz spare-parts business developed exceptionally well. In addition the Global Logistics Center will be in charge of the supply of spare-parts for smart and Chrysler products in the future.

Needless to say that other companies are following similar policies, including small and medium enterprises. This way the general basic pattern is to focus on electronic interaction, leaving the necessary physical transaction within the remit of qualified professionals, or in other words the logistic business.

In summary, we are confronted with a rapidly increasing transport demand, being in line with comprehensive requirements on how transport is being realized efficiently. Some aspects of this changing logistics scenery are elaborated in this paper.

2. Trends in Transport and Logistics

While in the US the logistics business seems to be well developed and Asia is showing quite diverse phenomena in this field, the European logistics markets are give a very dynamic, rapidly changing impression. DIEZ (3) points out some of the megatrends or driving forces affecting future European transport business:

1. Growth differences: High growth rates for express goods, medium for piece loads, low for complete loading
2. Political guidelines: National and EU regulations
3. Customer orientation: Customized service, delivery reliability, flexibility, and safety as crucial requirements
4. Professionalization: Outsourcing of logistics services, specialization of operators
5. Market differentiation: Separation of a) planning organization from b) transport operation
6. Concentration: Development of European Networks, advanced telecommunication systems
7. Co-operation: Concentration processes of logistics companies imply co-operation between transport providers

Some of these developments and phenomena have been discussed extensively elsewhere (4). Although this research is focusing on Europe, we are encountering similar trends in other parts of the world, albeit with differences in speed and intensity. As the logistics business is seen to be on the road to internationalization, these differences might disappear in the medium run. What might be surprising from the customer’s point of view, is that money is not the primary criterion or requirement. The top five are (5): Reliability, flexibility, safety/security, status monitoring, and packing/environmental soundness. Nevertheless, price will play its role, but we see a great potential of efficiency improvements, so that good logistics performance can be realized at cost levels similar to today’s.

3. Research platform

In order to meet the requirements resulting from the described fundamental changes a greater integration of logistics management beyond traditional boundaries and practices in the sphere of transport is absolutely inevitable. In spite of a growing approval for integration throughout the transport sector and attempts at restructuring in response still conventional transport solutions continue to be dominant and intermodal transport has not yet achieved a satisfactory level.

One of the main problems is that such attempts are often founded upon incomplete and subjective knowledge, primarily due to the agents being plagued by a tunnel-vision. This results in a patchwork of sub-optimal solutions working independently in the greater scheme of transportation. Should perspectives be allowed to remain narrow according to specific functions, the far-reaching synergies and optimum potential of transport systems will remain vague and elusive. Future actors in the field of worldwide transportation stand before a wealth of options, which could lead to fundamental process reinvention in the market structure of freight transport (6). In order to establish robust strategies transparent knowledge of the interdependence is needed for the parties involved.

Rather than to focus on a specific part of the equation, the overview and the linked description of possible future developments of global transport systems will provide indications for the development of effective transport technologies and organizations.
In order to understand the high dynamics in the field of future logistics DaimlerChrysler research initiated a project to do three things; develop an intelligence for the status quo and to anticipate future trends in transportation and to analyze the potential impact on the parties involved in terms of resulting challenges and opportunities. As a major element a workshop together with experts from science and practice as well as representatives of various DaimlerChrysler divisions was held to overcome the tunnel-vision and to addresses key issues related to freight structure, intermodal freight transportation, strategic alliances in transportation, and e-commerce. External experts included University, Consultancy, Port Authority, Airline Cargo, forwarding agency as well as Product- and Productionplanning, Strategic Planning, Mergers & Acquisitions, Logistics, Research and Technology from DaimlerChrysler. The range of participants provided an unbiased picture. The limited number of participants offered the possibility for exclusive discussions.

As the objective of the workshop was to anticipate future trends in the dynamic field of logistics and transportation, strict guidelines for the topics were not given. The intention was to provide a flexible framework and to stimulate innovative or even visionary discussions, as a source for future innovative transport and logistical approaches. However, the following questions enabled the participants to mentally prepare for the workshop and to pre-structure their mind-set.

- Which developments regarding freight transport, freight structure, respective infrastructure and means of transportation can be identified to effect freight traffic?
- Which intermodal freight transportation trends can be identified? What relevance and impact do they have?
- Which industrially driven developments effect transportation and logistics (globalization, outsourcing, M&A)?
- Do specific parts of the transport chain exist, in which we find today new and innovative solutions?

4. Selected Results

The obvious statement that complex problems do not end at disciplinary borders is easier to declare than to implement. Although participants in the workshop were at first surprised by the composition of the team it turned out that in fact the broad-based approach with various experts from science as well as practice and the resulting intellectual exchange was productive and offered the best prospects in identifying decision-orientated output.

In general it is easier to build a consensus on the higher aggregated driving forces which function as a common denominator, with all parties involved. Usually identified driving forces are broken down into specific actions by disciplinary teams or even single experts. This method leads again to isolated solutions.
At first sight and maybe surprisingly, the participants identified the general challenges and opportunities in the field of transportation as well as the links between specific technical and organizational details, which are essential in efficiently operating intermodal transportation.

At this point let us focus on those driving forces in the international transportation and logistics business that have been elaborated both through scenario workshop discussions and wide-range desk research. Nevertheless, it is a subjective, non-comprehensive selection.

a) We see a remarkably increasing size of transoceanic vessels, with a capacity up to 16000 TEU. This is much more than just a technical detail, and the impact of this development is worth reflecting on. It is simply more than doubling the capacity per unit. Thus international sea transport figures might increase massively, with a high degree of containerization (at relatively low costs). This could open up essential possibilities for stronger internationalization of value chains, giving companies much more freedom in time and space regarding where production is located. Decisions of this type can be easily revised, and any change in the value-added process can be realized in the short term.

b) Parallel to this development described above increasing sizes of cargo aircraft can also be projected, as well. This is leading to new logistical challenges on the ground. As a consideration, one major international parcel carrier today is processing its entire loading entering, leaving, and shipment within the US overnight at one central hub, in less than five hours. Assuming a higher degree of automation in ground operations over the coming years, we expect an increasing efficiency. This could mean that anyone can ship any good, parcel, or document to any destination within two days, likely covering 80 or 90 % of the world’s population with this service.

c) Currently a dynamic process of vertical co-operation between cargo airlines and road feeders can be observed. What might be the reasons for this development? At first, co-operation is an important success factor in any intermodal logistics operation, increasing the efficiency of the entire performance. Secondly, more and more customers tend to require one-stop-shops, i.e. having the logistics operation in the hands of one operator. Once this business model is available, other forms of customer relationship will not be accepted on the marketplace. Thirdly, having the logistics chain at one’s disposal gives a lot of potential flexibility to the operator.

d) Logistics and transportation are to date and will remain highly competitive fields of business, implying operators’ performance is intensively monitored by the customers. Once standards are set – be it speed, reliability, flexibility, quality of cargo handling, ... – these benchmark performance indicators become obligatory for any provider. We expect the emergence of a handful of leading, top-performing operators establishing these kind of best practices and pushing less efficient shippers to unattractive market segments.
Finally, the future role of the internet has to be evaluated. Either business-to-customer or business-to-business activities often require prompt response with regard to physical movement. Furthermore, internet based portals for offering and hiring freight capacities are being established, enabling auction-like logistics service markets. This does not mean that long-term relationships with a high degree of scheduled services will disappear. Rather market segmentation can be expected, comprising long-term contracts on the one hand, and online hot-spot auctions on the other. Those logistics organizations being competent in each of these segments worldwide will be successful, presumably at a very high performance level.

5. Scenario of International Logistics

The following model scenario including a forwarding agency, a port operator, a logistic provider and an equipment manufacturer illustrates how a single technical aspect can be extracted from and expanded again to the driving forces of transportation. This view of a possible future is made up of a step-by-step integration of several different developments, providing an unprejudiced insight into a plausible future situation.

A quick response to unforeseen changes in the transport chain regarding e.g. delivery time and place for instance, will lead to flexible redundant transport systems in order to lower costs and balance capacities of different carriers by adaptable freight matching during transportation. As a result the typical affinity between certain goods and carriers will gradually diminish and transshipment hubs will become more important as physical and informational knots within the transport chain.

Cultivated for decades the bond between information and freight is relatively secured and swift as long as freight and carrier are directly matched on a one-time point to point single mode transport. The situation completely changes when various goods from different carriers concentrate at the same time in logistic centers, e.g. a seaport, where they are mixed and matched and forwarded again according to multiple criteria often within minutes.

On the side of the data flow, freight related information required by a two ton truck differs fundamentally from that for a 6000TEU post-panamac ocean liner. Information about dimensions, weight and gadgets for fixations are truck relevant. Important for the shipping company is to know if the containers are stackable and weatherproof. In the least critical event the corresponding freight is in a container conveyed by a single crane directly from truck to deck. Anticipating forthcoming transshipment the crane requires data on where to stack the container on deck of the ship. As occasionally cranes grip containers but lift trucks as well, it is also essential for the crane to receive a signal if the bolts that fix the container to the truck trailer are released. Consequently for a totally optimized solution soft- and hardware of trucks and cranes have to be coordinated. Further standardization of containers in
respect to e.g. dimensions and identification, for example, would optimize intermodal transportation.

Thus automated handling solutions with intelligent data transfer and unified interfaces utilizing integrated IT-systems are the next steps for ports. On the hardware-side this process indicates a high demand for major investments from port operators as well as the establishment of unified standards. Intense competition between port operators, increasing handling times of up to 170 movements per ship and hour, increasing freight volumes and decreasing profits will continue to gather momentum and contribute to a structural change in the sector towards a vision of 8 to 10 major port operators.

The integrated management of information includes all data from the present position of the freight to the status of adjustment bolts connecting container and truck-trailer and supplies from customer to crane; each party having its particular features. The existing IT-systems are based on modified standard products. However the utilized systems are neither linked to each other, nor do they combine related options across physical or organizational frontiers. The link between freight and carrier is relatively loose during transshipment. In order to master the current transport segmentation by mode it is essential to focus on the total freight trip. Only an integrated shipment tracing and information system can control and secure the flow of freight throughout the journey. The position of logistics in general and the role of the information flow in particular are profoundly effected by this development. Besides its vertically-oriented, inter-organizational function, logistics will turn into a horizontal, intra-organizational service linking suppliers, manufactures, carriers, distributors, retailers and customers with each other. This service will be offered and optimized by independent logistics enablers supporting all types of companies.
As demonstrated in the scenario it is definitely not sufficient to agree on common macro-trends and then work separately on isolated technical details. Only synchronized cross-functional coordination on all individual levels offers a solid concept. With the help of integrated EDI-solutions in the future all actions from trading to handling and related information will not only increase speed, but also flexibility, security and reliability.

6. Research Outlook

The findings, statements, and projections discussed above should not be understood as a final, systematic result structure. What we listed is rather some interim balance, or messages from an ongoing research process. As international transportation and logistics markets are dynamic and volatile research objects, provisional perceptions are useful in coping with the speed of change in reality. Furthermore, for future research we need structured hypotheses to focus research activities on the most interesting topics. At date we are able to formulate some questions representing some of the hottest issues for which solid knowledge is a pre-requisite for sustainable and strategic evaluation of trends and driving forces:

- To what degree, at what speed will changes to much more internationalized value-network patterns be realized? Will there be winning and losing regions, maybe establishing "new" emerging regions?
- Are tendencies towards much more environmentally sound, sustainable transportation and logistics services imaginable?
- Or to the contrary, could there be a structural trend towards local/regional consumption patterns, enforced by exploding energy prices or uncontrollable security problems in the web or in the transport systems (or fostered by changes in societal values and attitudes)?
- Combining together some of the statements above, it is perhaps safe to assume that large parts of the transportation and logistics business might be under the control of a few companies or alliances. Will this be the basic pattern, and to what pace intensity will it be put into effect?
- In some industries, such as music and sports/leisure goods production, capacities are treated as commodities, while knowledge and disposal of procurement networks, logistics, and distribution channels are crucial competencies. Will this virtual business model diffuse into other commercial areas, making availability of international logistics hubs and knots decisive bottlenecks for any global business?

Obviously, it is impossible to develop precise forecasts about the future of the logistics business, bringing questions rather than answers to the agenda. But this is not a situation of shortcoming, for it indicates that attempts to shape the future are much more important than to forecast it. Understanding the current situation and
ongoing processes, and developing strategic options via scenarios of future business environments are in this sense prerequisites for prudent and courageous action, and therefore one of the most distinguished tasks for science as advisors of business action.

References


(3) DIEZ, W., quoted in: Logistik USA-Europa: Wer gibt die Richtung an? in: MB-Transport Magazin, 1/1999, p. 10-13


(5) DIEZ, op.cit.