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Logistics Trends 2020: A National Delphi Study Concerning the German Logistics Sector

Stephan Zelewski, Alessa Münchow-Küster and René Föhring

Abstract

The logistics sector is subject to profound changes that are caused by technological innovations as well as by structural changes in the implementation of logistics business processes. Therefore, it is important for companies to recognize such changes in an early stage and to prepare for them strategically. This applies not only for directly concerned logistics service providing companies, but also for forwarders in general.

Within a Delphi study, a team of the University Duisburg-Essen researched pioneering changes in the logistics sector and the underlying change driving forces. Over one hundred logistics experts from economy, science and politics have been systematically questioned about future logistics trends with the help of an online questionnaire. The survey stretched over four rounds in total with Delphi-typical quantitative and qualitative feedback for the participants.

Altogether, about 500 hypothetical logistics trends – of organizational-conceptual as well as of technological kind – have been identified and evaluated regarding their economical relevance. At the end of the Delphi study, 10 organizational-conceptual and additional 10 technological essential logistics trends emerged. They were carefully examined in three dimensions: probability of occurrence, desirability of occurrence and impact on the logistics sector. The key results of this current Delphi study will be presented and commented from a business point of view. Action fields important for a strategic positioning of logistics companies in their future competitive environments will be illustrated in particular.

Keywords: delphi study, empirical research, logistics trends, online survey

1. Motivation and Overview

In consequence of the growing globalization, the tightening of resources, the technological progress and because of the openly increasing environmental awareness the logistics sector is continually confronted by profound and far reaching changes within its economical, technological and political-social environment. It is crucial for a strategically prospective, proactive management of logistics companies to recognize presumable future trends in logistics in one of these environments, to rate the action relevancy concerning the own company and to gear oneself up as soon as possible for those future trends in logistics that have been regarded as particularly relevant. It is necessary to that end to plan and to implement respective measures concerning the development of a company with strategic foresight. Such development measures can reach from the conversion to innovative technologies at an early stage via the introduction of new forms of organization and equally new economical concepts regarding processes and systems through to increased investments into the own human capital by means of in-company training and development as well as inter-company training and development.

For the previously outlined proactive management haulage companies require orientational knowledge concerning the changes within the logistical environment and regarding which changes can most probably be expected to become "future trends of logistics". However, such orientational knowledge is usually impossible to acquire for individual companies because the resources regarding time and personnel necessary to that end are only hardly available in the day-to-day routine of the company. Furthermore, studies with long-term focus do often not come into being in practical operations in the face of the ubiquitous stress of competition caused by competitors and in the face of the pressure to succeed induced by stockholders – despite the general acknowledgement to being in need of strategic planning. The pressure on operative problems often curtails open spaces enabling long-term focused

strategic thinking drastically. This also especially applies to the logistics sector as its companies mostly are in a very fierce cost competition.

Against this background a Delphi study on trends in logistics up to the year 2020 has been carried out by the Institute of Production and Industrial Information Management of the University Duisburg-Essen. The study will – for the sake of shortness – in the following be called "Logistics Trends 2020". The Delphi study's goal was to ascertain, collect and systematically process expert knowledge on future anticipated relevant organizational-conceptual and technological developments in logistics. This expert knowledge was then supposed to be made available as orientational knowledge to the interested public, especially to the practical operations. The Delphi study took place in the course of the joint project "Logistik Online Forwarding 2020" (LOGFOR), which was accompanied by the Institute for Logistics & Service Management of the FOM University of Applied Sciences in Essen. The institute functioned as the project partner in charge. Added to this there also were several practice partners. Especially the Schenker Deutschland AG, the GFW Duisburg, the Chamber of Industry and Commerce responsible for the cities of Essen, Mülheim an der Ruhr, Oberhausen located in Essen as well as the Niederrhein Chamber of Industry and Commerce responsible for the cities of Duisburg, Wesel and Kleve located in Duisburg.

In this abbreviated form the Delphi study "Logistics Trends 2020" cannot be all-encompassingly introduced. Instead this paper confines itself to describing the methodical design of this study in chapter 2, and in chapter 3 to presenting the most important results. In chapter 4 implications are being examined which resulted from study results for logistics companies.

For those who are interested in details regarding the Delphi study "Logistics Trends 2020" can find a comprehensive documentation in Zelewski and Münchow-Küster (2012a). In addition to it competing, however less differentiated studies concerning future trends in the logistics sector can be found especially in Winklbauer, et. al. (2009) as well as in PwC and IFK (2012).

2. Design of the Delphi Study

In an overview paper like this it is not possible to elaborate on the methodical basics of Delphi studies. Instead a short characterization of the Delphi method, which underlies every Delphi study, has to be sufficient: The Delphi method is a general schema for the systematic aggregation of judgments made by several experts who are adept in problem areas which are characterized by incomplete and especially extremely vague knowledge. It specifies a multistage-iterative, mediated and anonymized group communication process conducted in written form. This group communication process is primarily adjusted to a tendential convergence of the expert judgments and ideally even to a consensus of the partaking experts. For that purpose a controlled feedback on interim results is given to the partaking experts.

For detailed descriptions and also partly critical analysis of the Delphi method interested parties can refer to relevant subject literature; confer e.g. Häder and Häder (2000), Linstone and Turoff (1975/2002), Loo (2002), Vorgrimler and Wübben (2003), Okoli and Pawlowski (2004), Brown (2007), Nielsen and Thangadurai (2007), Cuhls (2009), Gregersen (2011), Zelewski and Münchow-Küster (2012b). Especially the profound and also easily understandable remarks of Häder (2009) can be pointed to.

In the center of the Delphi study "Logistics Trends 2020" stood the research question: "What will be the organizational-conceptual and technological trends in logistics in the German-speaking world up to the year 2020?". With the reference to the German-speaking world an elicitation of expertise of experts in logistics "in all of Germany" was to the fore because of "pragmatic" reasons of the used language in discourse and because of the familiarity of business cultures.

However, the commuting area of the study was not limited to experts in logistics coming from Germany, but also experts in logistics from Austria and Switzerland and in some few (German speaking) individual cases from Belgium, Denmark and Luxembourg as well were involved. In addition to this no

limitation on Germany and the German-speaking world regarding the contents was made. Considering globalization, which was mentioned in the beginning and which belongs to the everyday business of numerous companies in the logistics sector, it was clear right from the start that problems and questions regarding future trends in logistics would be answered and looked at by experts not only focused on one national submarket but against the background of internationally interconnected logistics services.

The above-mentioned central research question of the Delphi study was differentiated into several dimensions in order to be able to gain a wide range of orientational knowledge for the business practice. Therefore the following working hypotheses were taken as a starting point: Assumingly there are different perceptions from scientists, practitioners and politicians of organizational-conceptual on the one hand and of technological future trends in logistics on the other hand. Furthermore the ways these trends will be seen probably differentiate into three dimensions: considering the probability of the trend realization, considering the desirability of the trend realization as well as considering their impact on the logistics sector.

On the basis of these working hypotheses two knowledge goals were followed with the help of the Delphi study. The first goal was to generate and aggregate ideas in order to identify as many candidates for organizational-conceptual and for technological trends in the area of logistics as possible. The second goal was to filter out those trends out of the identified trend candidates which will be economically most relevant for the logistics sector in the future. In accordance with the previously mentioned trend dimensions the assessment of relevance happened on the one hand with regard to the probability of realizing a trend in the area of logistics up to the year 2020, with respect to the desirability of the trend realization as well as with reference to the supposed impact of the trend realization on the logistics sector within the named period of time. On the other hand, in the course of the assessment of relevance it was differentiated between the three groups of stakeholders, the scientist, the practitioners and the politicians.

1,300 experts from the fields of science, economy and politics were invited to take part in the Delphi study. 118 of the addressed experts agreed to take part in the Delphi study.

This corresponds to a participation ratio of approx. 9.1%. The drop-out rate was, at the end of the last survey round, approx. 73.7%. This high figure can be put down to fatigue, which is typical for Delphi studies. 31 experts took part in the last survey round, of which 21 (67.7%) were scholars and 10 (32.3%) were practitioners. No experts from the group of politicians, who had contributed to the first round, had persevered to the fourth and final survey round. This was surprising as politicians, free from the day to day pressures of operational (or also scientific) everyday life, would be expected to take a persistent part in the Delphi study, especially with their frequent support of employees, and their interests, but also publicly stating their beliefs of “shaping the future”.

The first survey was a purely exploratory study and was thus a qualitative survey of the experts which should identify as many of the logistical trends until 2020 as possible. As a unique selling point in comparison to other Delphi studies, and other technological foresight studies, the experts were requested from the start to differentiate logistical trends as either organizational-conceptual or technological developments. In this way the study would not be “technologically driven” like numerous other studies that are prevalent in futures studies. With the Delphi study “Logistical Trends 2020” equal importance would be placed on identifying and evaluating business trends in the logistics sector as technological trends.

In order to avoid possible misunderstanding especially on the side of the practitioners and politicians, who often equate the attribute “economically” – unjustified with regard to the content – with a purely profit-oriented way of thinking, the Delphi study did not explicitly use the term “economical” but discussed on organizational-conceptual trends.

All in all more than 500 hypotheses on presumed organizational-conceptual and technological developments in the logistics sector were generated in the first survey round as candidates for future trends in logistics. In the following

three further survey rounds, which were aligned qualitatively as well as quantitatively, the hypothetical knowledge on potential trends in logistics was systematically edited by the monitoring team of the Essen Institute of Production and Industrial Information Management and reflected back to the experts. With this feedback it was planned to gain a consensus – or at least an approximate convergence – of the judgments of the experts in the course of the Delphi study.

For this purpose the at first more than 500 hypotheses on presumed organizational-conceptual and technological developments in the logistics sector were reduced to a number of only 103 trend candidates, a number "easier to manage". This happened on the passage from survey round one to survey round two. The congestion of the range of the further questioned trend candidates was necessary on the one hand in order to keep the strain of the surveyed scholars, practitioners and politicians within a "reasonable" limit regarding their expert judgments. On the other hand the step of congesting the number of candidates was also necessary in order to bundle up content-related equivalent or at least very similar hypotheses into only one hypothetical trend in logistics each.

On this basis, the experts were asked to judge the trend candidates, which had been identified in the first survey round and which had been edited (congested) by the monitoring team. On one side, the expert judgments were supposed to cover the probability of the trend realization in the area of logistics. On the other side, they were also supposed to refer to the desirability of the trend realization within the own company (with respect to practitioners) or within the own area of research or responsibility (with respect to scholars or politicians).

In the fourth and last survey round a concentration of expert judgments followed with the result of a compact range of those trends in logistics whose realization had been estimated the most probable by the experts during the third survey round (essential trends in logistics). Only the ten most probable trends in logistics each organizational-conceptual on the one hand and technological on the other hand were considered. As a result of this

concentration it was possible to confront the experts with a third evaluation dimension. In the final fourth survey round they were supposed to rate the most important trends in logistics regarding the impact of their realization on the logistics sector as well.

Each expert judgment was needed to be entered on a four step rating scale which corresponds to a simplified ("approximated") Likert scale. The even number of four rating levels each was preset deliberately in order to deny the experts the possibility of rating along the lines of "fleeing into the undecided middle". Therefore, they were induced to either decide on a "positive" or alternatively on a "negative" decision stamping. Additionally the answer option "prefer not to say" was provided so that experts who did not regard themselves capable of giving a profound judgment concerning a special question were given a possibility to explicitly express it. By this means it was avoided to feeling obliged to choose "some" random answer option in case of lacking power of judgment. This would have led to a content-related distortion of the evaluation of the experts' answers.

In the beginning of the third and fourth survey rounds of the Delphi study the quantitative information on the interim results of the each preceding survey rounds was given to the surveyed experts in the form of a statistical group answer. This statistical group answer consisted for each supposed trend in logistics of the arithmetical mean score and the median as an expression of the trend of the expert judgments on the one hand and of the standard deviation in order to inform about the extent of the deviation of the provided expert judgments on each trend up to this point on the other hand. In addition to this the frequency distributions of the expert judgments displayed on the underlying four step rating scale were visualized graphically. This feedback information served to brief the experts on the current trend of the aggregated expert judgments and on the current extent of the approximation to a consensus. The experts were also asked to explain their trend-unconformable expert judgment with regards to the content in case that their judgment differed from the emerging trend. Both aspects – the feedback of organizational-conceptual

group answers as well as the request for qualitative explaining of divergent expert judgments – are typical for the course of a Delphi study as the course's goal is to induce a consensus of the surveyed experts or at least to cause a tendential convergence of the experts' judgments.

In the following the results of the Delphi study "Logistics Trends 2020" are presented and commented in an overview. They resulted from the end of the fourth survey round. Because of the necessary shortness only the study results, which were gained considering the sum of all partaking logistics experts, are elaborated. A differentiated reflection which differentiates between the three groups of stakeholders, the scholars, the practitioners and the politicians, is denied here at this point; for this confer the detailed results in Münchow-Küster and Zelewski (2012).

3. Results of the Delphi study

3.1 Organizational-conceptual trends in logistics

On the basis of Figure 1 (see next page) it is recognizable that the ten most relevant trends in logistics of organizational-conceptual manner are judged throughout with high proportion regarding all three dimensions, the probability of their realization in the area of logistics, the desirability of their realization within the own company or research area as well as the impact of their realization on the logistics sector.

The experts certified the highest probability of realization to the increase in the importance of the management of risks and security in the logistics sector as well as the increase in the importance of fee charging regimes, e.g. such as customs, tolls and other road pricing systems. On the contrary, the increase in the importance of industry know-how regarding the area of logistics was judged as being least probable.

Concerning the estimates of trends in logistics regarding the desirability of their realization similar high values can be observed. The highest desirability proves to be the logistics trend "Supply chain management in general". On the

opposite, the both logistics trends "Increase in the importance of e-procurement" and "Increase in the importance of industry know-how" turn out to be the least desirable.

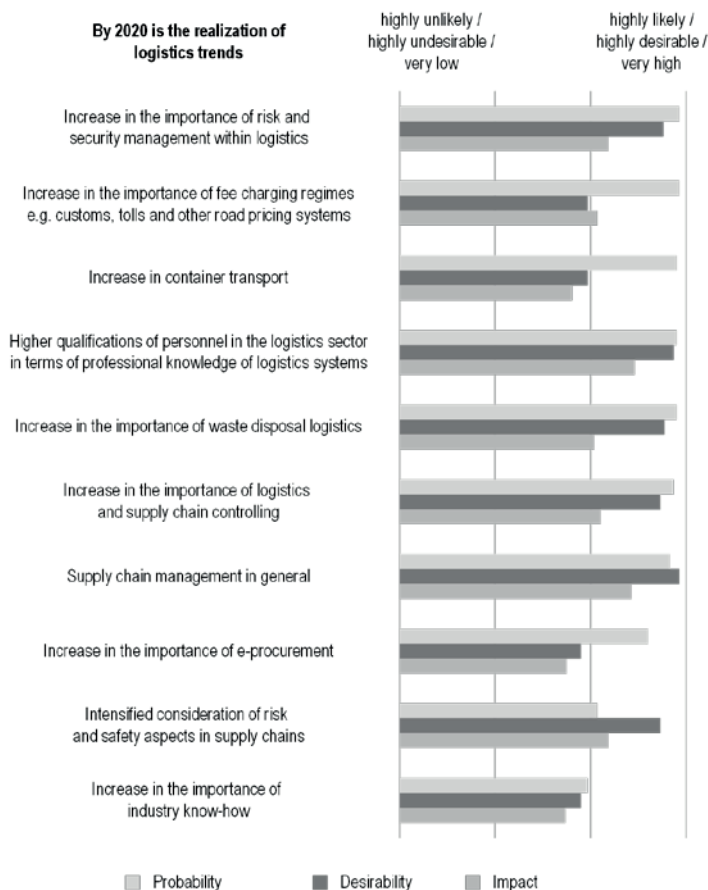


Fig.1: Estimates regarding organizational-conceptual trends in logistics

The result named last is astonishing because the relatively low desirability of increasing industry know-how regarding the area of logistics goes directly

against the obvious strategic positioning of companies of the logistics sector which obtain an advantage with respect to competitive differentiation with the help of their specific industry know-how in relation to other competitors.

The experts estimate the impact of the logistics trend "Higher qualifications of staff in the logistics sector in terms of specialized knowledge of logistics systems" to be highest. It is closely followed by the effects of the logistics trend "Supply chain management in general". The logistics trend "Increase in the importance of industry know-how" comes in last place. This last place should be put into perspective, though, as it only refers to the positioning within the scope of the ten most probable trends in logistics. Regarding the whole picture with an absolute view the impact of this trend in logistics is still judged as "rather high".

3.2 Technological trends in logistics

Figure 2 (see next page) displays the ten essential trends in logistics of technological manner whose probability of realization is judged throughout as very high by the surveyed experts. The logistics trend "Application of telematics" and "Computerization, viz. deeper penetration of logistical systems with information and communication technology (ICT)" are considered to be most probable. On the opposite, the logistics trends "Implementation of simulation models and methods (in the area of logistics)" as well as "Traffic information systems to reduce greenhouse gas emissions" are regarded to be least probable.

Another rank order arises as a result concerning the desirability of realization of technological trends in logistics. The logistics trends "Networking and integration through IT systems", "Traffic information systems to real time route management" and "Real time capability of transport information systems" take the first place each.

The realizations of the logistics trends "Implementation of GPS systems", "Electronic marketplaces for haulage services (Freight exchanges)" and "Application of mobile computing" are only considered rather desirable.

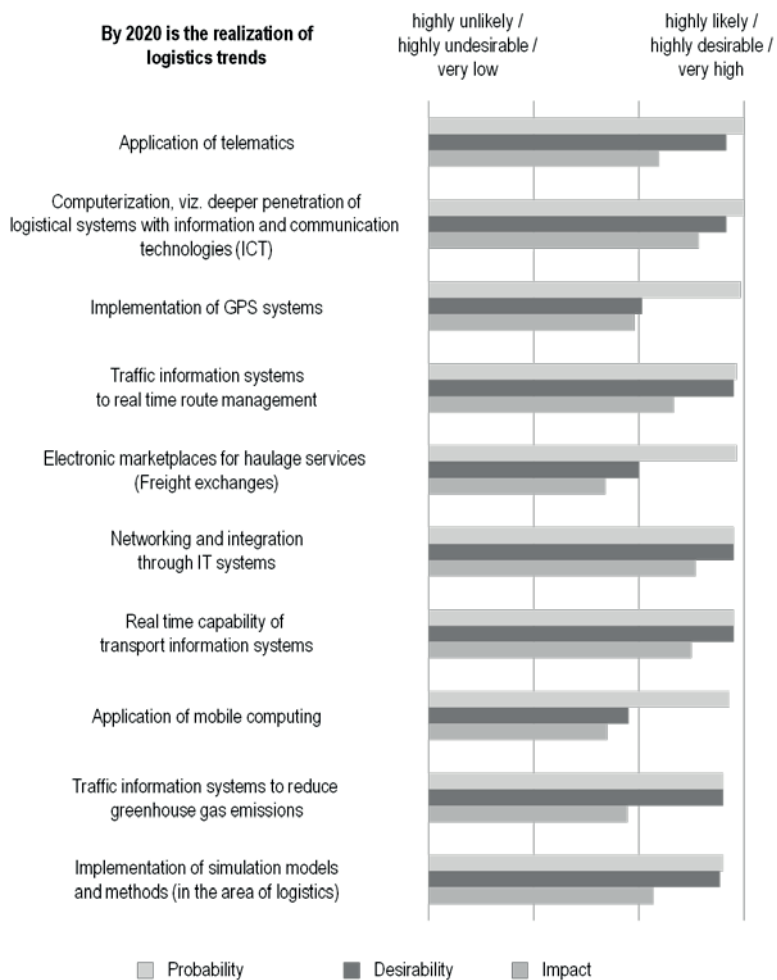


Fig. 2: Estimates regarding technological trends in logistics

The realizations of the logistic trends "Networking and integration through IT systems", "Computerization, viz. deeper penetration of logistical systems with information and communication technology (ICT)" as well as "Real time

capability of transport information systems" are associated with very high impact on the logistics sector. In contrast, the experts judge all the other technological trends in logistics more reservedly by considering their impact as being only "rather high". Especially the impact of the logistics trend "Electronic marketplaces for haulage services (Freight exchanges)" is considered much lower in comparison to the impact of all the other logistics trends of organizational-conceptual or technological manner. This depicts a surprising result because the application of electronic market places is usually attributed a high impact in economical professional literature, but also on the logistics sector as well.

4. Implications for companies of the logistics sector

From the point of view of organizational-conceptual trends it is noticeable that the increasing importance of fee charging regimes, like e.g. customs, tolls and other road pricing systems, is considered and ranked the trend in logistics with the highest probability of being realized. This instantly means for companies of the logistics sector that it is necessary to plan on with a tightened cost pressure in the long run in consequence of the sovereignly imposed additional charges. Because of the high competitive intensity with regard to production and logistics companies this tightened cost pressure will probably not be able to be passed onto the customer base by means of increasing prices. It is far more probable that it will cut down the profit margin of the logistics companies. Therefore logistics companies with an only low capacity to compete are supposed to be exited from this competitive market. In the face of this supposed development it does not astonish that this logistics trend regarding its desirability has been placed sixth place, that is the second to the last place. On the contrary, it is even surprising that this trend in logistics was not placed on the lowest rank with a distinctly higher mean score – in accordance with a very high extent of undesirability.

It is remarkable that the increasing importance of the management of risk and security was likewise judged as a substantial trend in logistics with the same high probability of realization. Therefore provides for logistics companies the opportunity to gain a differentiating advantage in the competitive environment by proactive acting, e.g. by investing even now into sophisticated systems for the management of risk and security. This differentiating strategy enables individual companies which invest especially early and especially sustainably to escape – at least partially – from the supposed increasing cost pressure, which can be expected regarding the initially explained trends in logistics.

The logistics trend of an increasing importance of logistics and supply chain controlling, which has been ranked third after all regarding its probability of realization by the experts, indicates the same problem solution. The reason is controlling systems, which allow the implementation of informatively monitoring orders end-to-end in space and time ("tracking and tracing") as well as regarding the contents as well, are able to support the introduction of effective systems for the management of risk and security. For example, a continuous shipment tracking makes it possible to provide information on the current temperature of a temperature sensitive shipment or information on an incorrect or even unauthorized opening of a packing or of a transport container. In case such controlling information is provided by means of a system for the management of risks and security, it is possible to recognize e.g. the risk of missing a deadline or the risk of transported goods getting ruined or spoilt as well as the risk of security breaches during a transport and then to introduce countermeasures in good time. In this way it is possible to implement the economical concept of supply chain event management into the operational practice with the help of an integrative consideration of the two logistics trends "Increase in the importance of risk and security management within logistics" and "Increase in the importance of logistics and supply chain controlling".

Eventually, it should be emphasized that the trend regarding the enhancing of professional competence of the personnel with respect to the professional knowledge on logistical systems was ranked second place concerning its

probability of realization by the surveyed experts. Therefore it is recommended to the companies in the logistics sector to invest into the respective in-company or inter-company training and development.

From a technological point of view it proves itself remarkable that no individual logistics trend in particular stands out regarding its relevance for companies in the logistics sector, but rather a combination of five trends in logistics. It concerns – ranked according to the probability of their realization – the application of telematics as well as the computerization, it concerns the application of GPS systems, traffic information systems to real time route management as well as the real time capability of transport information systems. A combination of all these five technological trends in logistics seems to be the thing to do in order to implement the concept of the "continuous" shipment tracking including corresponding added value services. In addition to this it is also possible to hereby strengthen the efficiency of the above mentioned economical concept of supply chain event management within the operational practice.

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