

HYBRID NETWORKS – THE LOGISTIC FUTURE IN THE EU

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There is a trend for the increased use of the hybrid networks. The multi-mode networks are a specific example of hybrid networks, especially if these nodes are used in parallel and not sequentially.

Hybridization occurs at all levels: production, inventory and transport. Through a general mechanism of planning and control, shortcuts are created allowing flow strengthening and rapid and trustworthy delivery. These trends usually appear from the customer's increasing requests, translated into the transporter's request. Generally, the transport delivery stays behind and this is the case especially with the outdated inter-mode transport nodes which try only to optimize the flows; since they occur at every train station (in the case of railways), they are not capable to cope with these growing requests. A specific consequence of the hybrid network appearance is the stabilization over time of logistics processes. Better planning leads to smaller uncertainty and to the opportunity to use slower, but more effective transport methods.

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1. The need of flexible infrastructures

Following the increased degree of sophistication requested in the logistic systems in order to meet the users' growing needs, there is a great demand of flexible logistic networks aiming at:

- efficiency with respect to costs and goods;
- answers to the customers' changing needs;
- obtaining the market advantage;

The first objective is the most important, because only if the logistic structures are effective they may be able to provide feasible solutions in a growingly competitive environment. Strengthening and collaboration are the most logical means to generate smaller costs per transport unit. Through flow **strengthening**, larger vehicles may be used and the loading efficiency is at its best. Through **collaboration**, the logistic activities also become possible, resulting in a slower asset flow through the logistic system and, as a result, a greater use of resources, but, at the same time, it also creates the opportunity to use cheaper and slower transportation means and avoids the need to create safety stocks.

The high feedback level which is required may enter into conflict with the above-mentioned need of slower asset flows, but avoiding the potential conflict is one of the greatest challenges in projecting the logistic network. The systematization of the hybrid network for production, storage and transportation creates the requested flexibility of a part of the production with a patent demand which may be foreseen long before is manufactured in far-away locations that use a low level of the labor force. The remaining production is postponed up to the last possible moment in locations as close to the customer as possible.

The valuable products with a low demand frequency are stored centrally and may be delivered rapidly for long distances if the reduction of inventory costs exceeds the additional costs of the transportation of small size batches using the express transport. The use of slow and cheap transportation means combined with more rapid transportation means may sometimes be more advantageous than that with high, expensive one, especially for products with a lower value density and a high degree of demand safety.

All these examples indicate that the hybrid networks may combine the advantages both of all the alternative networks and the combination of an increased level of efficiency and flexibility.

2. Setting a strategic network project

As indicated by these examples, many logistics-related decisions are interrelated and together may create a flexible hybrid structure.

- Choosing the facility locations;
- The sample number ;

- The inventory policy per sample;
- Source decisions ;
- Indicating the customers' orders;
- Choosing the transportation means;
- Delivery frequency ;
- Delivery size ;
- Strengthening type ;
- Cross storage ;
- Choosing the itinerary.

This means that within the projected logistic networks, one should pay attention not to neglect such interdependencies and that it is dangerous to fragment the network design into a number of sub-issues involving the production and the decision related to the location of storehouses separately from the network solutions.

The factors which influence the selection of projecting a certain network are determined by internal and external circumstances. There are external factors, such as the requests for customer relations as to the transportation time and issued linked to taxes, which limit the degree of freedom with respect to the selection proper of the network project, but also the will to collaborate among the various partners in this logistic network may constrain the potential for the network optimization. There are also internal factors such as organizational issues which limit the selection freedom. If the chosen business strategy is to focus on the cost efficiency, it will create completely different alternatives as compared to when the selected strategy is related to the market answer concept. Another blocking factor may be the division of responsibilities into a chain of delivery for service levels, inventories and forecasts. In many organizations, the optimization of the logistic process is hindered by the organizational structure which divides the logistic-related responsibility to several persons or departments or even leads to under-optimization because each of such departments tries to pursue conflicting purposes.

Besides these organizational issues, there are also the physical features which limit the optimization possibilities. The economic exchanges and the assessment of the costs and benefits which influence these network decisions are set by certain key traits that largely influence the costs per production unit.

- The product features such as value density and the package density and the product-related specificity (country / customer) ;
- Possibility of postponing delivery ;
- Sale typical issues: slow vs. quick, season-related issues;
- Life products, cycle / aging;

In setting these hybrid structures to create flexibility opportunities, one may have a multitude of options which may facilitate the decision-making process:

- clarify the selection of structures and responsibilities;
- clarify the rules to keep track of costs and decision-making parameters;
- create transparency in selection options;
- create transparency related to the availability of stocks and resources for various samples and locations;

The transparency of the decision-making process depends on the availability of alternative data in danger. Sometimes, these data are hard to obtain also due to the lack of collaboration among the potential involved partners.

Generally, one may say that the decision to choose between a central, decentralized or hybrid solution depends on the comparison between the advantages and drawbacks of each of these options. The hybrid solution, if accurately designed, may best combine the 2 extremes.

However, in practice, the implementation of hybrid networks will depend on the desire to change and the innovation level of the sector involved.

3. New roles for transportation nodes in hybrid networks

Given the project and the organizational structure of all the parties involved in this project, there still are various degrees of freedom pertaining to the tactical and operational- organizational level. The network operation depends on the possibilities to synchronize the activities of each party involved. The synchronization has to do with the information exchange coordinated among the parties, which allows them to adjust their actions and avoid flow cessations or interruptions. In order to reach this stage, one needs:

- to improve the transparency along the supply chain;
- to improve the planning forecasts and procedures;
- to reduce uncertainty with respect to supply and demand;
- to create flexibility and to avoid panic decision;
- to create parallel source possibilities;

Especially within the hybrid network presented in the previous section, the level of information exchange related to the events that are to occur and the accomplishment of the planned activities must be much more intense than in the decentralized organization, where everybody is for him/herself.

Preoccupations and benefits for external design options

a. Centralized distribution

Benefits	Preoccupations
Close to the market answer	Large stock levels
Clear responsibilities	Cost management and competition
Ordinary local ITC	Input cost
Low managed risk	Internal transportation cost
Efficiency in the final distribution to the customer	LPS management contracts
Ordinary third parties	

b. Decentralized distribution

Benefits	Preoccupations
Cost transparency	Old stock
Stock control	Unclear responsibilities
Synergy for materials dealing with internal transportation	Complex ICT systems
Ordinary competence	Complexity risk
Great product availability	Flexibility in delivery
	Complex LPS management contracts

In such complicated networks there is the need for a chain administrator who coordinates all the related activities. Such an administrator must have the authority to force the parties to work according to the service level on which they have agreed.

In such a network, the provider of logistic services plays a crucial role. This party has to ensure that the commercial contracts of the manufacturers who created a consortium in order to deliver their products synchronically with their customers are made according to the service level agreement they set up. This means that in order to work effectively, the provider of logistic services must know what logistic contracts there are

between the involved parties and must also be aware of the production conventions and plans in advance. The provider of logistic services must also make sure that the resource use is optimized and that the proactive action is in place in case of unplanned activities that obstruct the current plan.

In case of a hybrid network, the provider of logistic services must decide which part of the orders will be performed in a certain manner and which part in some other manner. If he uses a hybrid network which facilitates parallel transport, between two modules of internal road and navigation according to the organizational structure, the orders coming on time are transported through a slow and cheap navigation system, while delayed unexpected orders or orders with a short distance between the departure and arrival point are delivered through road transport. On average, a transport which uses navigation lasts at least one day, whereas in Holland a truck transport lasts for about two hours. Most retailers require durations lower than 24 hours between order and delivery, which makes that navigation is not feasible. But by combining internal navigation and truck transport in a collaborating network, the navigating system becomes interesting. It is obvious that such a hybrid network requests a good coordination and synchronization of the shares of each partner in the logistic network.

Concluding remarks

Making a summary of the various – sometimes conflicting – trends in a unified image is difficult, but we can identify certain general ones:

- There is a trend for the increased use of the hybrid networks
- Hybridization occurs at all levels: production, inventory and transport.
- These trends usually appear from the customer's increasing requests, translated into the transporter's request.
- The increasing prices for transport due to the internalization of external costs and the increase of labor force and fuel will lead to the reproduction of transport costs and will increase the need to use cheaper transport nodes, if possible. The development of these logistic structures comes and goes in waves, but, due to the fragmented nature of the market, multiple solutions may be chosen for the same type of problems. The image may seem grey from a distance, but, seen more closely, it is certainly black and white.

The main forces behind these trends are the need to reduce the costs in order to remain competitive on globalized markets and the improved opportunities to control the logistic process using the information and communication technology.

Of course, not everybody will welcome these innovations, because they threaten the positions of current markets, and many of the logistic organization means do not rely only on technology, but also on trust. However, the need to remove under-optimization on increasingly competitive markets may be achieved only if the companies use the advantage of the available information and make such information transparent for the partners in the supply chain. In many cases, the existing level of information availability is enough to optimize the logistics process. If, however, the optimization need occurs due to the cost increase or higher quality requests, these barriers may disappear.

A specific consequence of the hybrid network appearance is the stabilization over time of logistics processes. Better planning leads to smaller uncertainty and to the opportunity to use slower, but more effective transport methods.

References

1. Bogers E. and D. Henstra (2003), *'State-of-the-art of intermodal freight transport, EUTRALOG Deliverable 4.1'*, accessed at <http://eutralog.mettle.org/deliverables.html>.
2. Foster, T. and R. Armstrong (2005), *Top 25 third-party logistics providers: bigger and broader'*, accessed at www.glscs.com.
3. Groothedde, B. (2005), *Towards Collaborative Logistics and Transportation Networks - A Modeling Approach to Hub Network Design*, Trail Research Series, 2005/15, Delft: Van Marken.
4. Groothedde, B., CJ. Ruijgrok and L. Tavasszy (2005), *Towards collaborative logistic hub networks'*, *Transportation Research Part E*, 41(6), 567-83.

5. Groothedde, B., L.A. Tavasszy and C.J. Ruijgrok (2003), '*Collaborative intermodal hub networks*', paper presented at the 2nd STELLA Focus Group 1 Meeting on 'Globalization, Economy and Trade', Brussels, accessed at www.stellaproject.org.
6. Ruijgrok, C.J. (2003), '*European transport: insights and challenges*', in A.M. Brewer, K.J. Button and D. Hensher (eds), *Handbook of Logistics and Supply Chain Management*, Amsterdam: Elsevier, pp. 29-46.
7. Trilog-consortium (1999), '*TRILOG-Europe end report*', Delft, TNO Intro, accessed at www.inro.tno.nl/trilog/