International logistics : the extend of outsourcing by manufacturers and impact on the transport industry.

The internationalization of manufacturers' production networks increases the complexity of distribution and supply chain management. Between suppliers, factories and markets, the distance is increased and products life-cycle is accelerated. We will therefore try to identify why a manufacturer may not produce internally the necessary logistics services and rely instead on outsourcing. The efficient operation of such supply chains by multinational companies requires a reorganization in two major ways : a redesign of production and circulation of goods (postponement ...) and a redefinition of actors' roles (supplier, factory, client, transport industry) along the chain. Such changes bear opportunities for transport actors willing to organize integrated logistics services, innovate in new services, take responsibility for final service quality, and also to bear the large cost of necessary infrastructures.

Keywords ***international logistics, outsourcing, supply-chain management, e-commerce.***

リュック・ベアル
Luc BEAL

Ph.D.（財）運輸政策研究機構運輸政策研究所研究員

1——Introduction

Together with improved telecommunication and transport technologies as well as increased international competition, the scope of possible investment locations for multinational companies is enlarged. As a result, multinational companies find themselves with widely internationalized production networks, the distance between their main markets and their factories being increasingly large.

The challenge for the transport industry to address such huge international flows of finished goods and components is even larger for consumer markets (electronics, computers, appliances...), due to the diminishing life cycles of products. The goods have to be delivered rapidly to the final customer and any delayed shipment or excess inventory translates in a financial loss for the manufacturer, therefore justifying generalized just in time delivery systems for components as well as for finished products.

More recently, the development of E-commerce is revolutionizing the relationship between the customer and the manufacturer and therefore requires a deep reorganization of logistics channels across national boundaries.

From private actors to governments.

Logistics are now a key issue for multinational companies and governments as well : *global manufacturers* see their international competitiveness and even their survival depending on efficient logistics. As for governments' transport policy making process, logistics have a critical role in attracting foreign investment as well as its impact on issues such as city congestion, air pollution...

Nevertheless, multinational companies can hardly rely on governments actions for the supply of infrastructures necessary to a smooth circulation of goods along international supply chains : in some countries, the supply of even plain infrastructures such as paved roads is not guaranteed, and as a result, a rising share of investments in international logistics are carried out by private actors, of the transport industry or among manufacturers themselves.

For the implementation and the smooth operation of their international supply chains, multinational companies have therefore to take decisions regarding their organization ... particularly :

(1) the *distribution of responsibilities* between the headquarters (in Japan for example) and more

decentralized coordination units like regional headquarters (Singapore for example) or the factories themselves (Indonesia, China...), particularly regarding the planning of production and the organization of sourcing.

(2) The *ownership structure* regarding each stage of the supply chain. Not only must the company decide whether to purchase or lease assets like warehouses or trucks : it has also to decide who *operates* each stage of the supply chain, particularly if there is a possibility for outsourcing to logistics specialists.

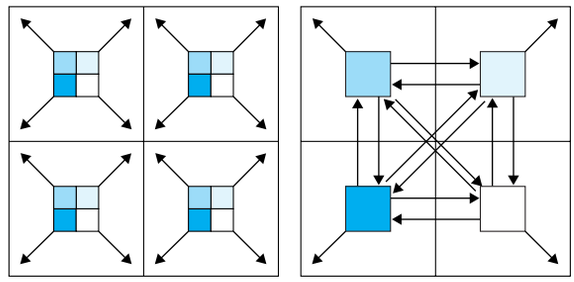
The logistics industry is now restructuring at a global stage : countless mergers of freight forwarders, integrators and transport companies bring actors with global network, extended range of logistics services and ... increasing market power. Multinational manufacturers have therefore the possibility to fully outsource their supply chain management... we will try to clarify in this article the reason why a manufacturer may decide to rely on external actors for its logistics needs. To that end, we will remind key elements for the definition of international supply chains and will outline the factors critical to their management. Finally, we will discuss the necessity of the outsourcing of international logistics management.

2——The organization of supply-chain management : towards a process-oriented pattern.

The topography of international production networks is determined by demand and technology parameters. On the *demand* side, the main factor is the globalization of markets, meaning that a single product (or modified by variants tailored to local tastes) is sold in a large number of countries.

The *technology* factors support the internationalization of production networks by facilitating efficient and cheap communications of goods and information. As far as *production technologies* are concerned, they dictate the structural patterns of international production systems : costly production technologies (automobile industry...) make the maximization of economies of scale a high priority, therefore imposing a minimum size for each factory. Similarly, as in the laptop computer industry, the interactive nature of the innovation process requires a dense network of suppliers located around the factory.

The respective location of production facilities and final markets will result, depending upon the firm considered, in various sourcing and distribution alternatives.



■ **Exhibit 1— International Production, sourcing and distribution : two alternatives.**
Source : Cooper-1993.

As the above exhibit shows, either the production system is duplicated for each major host market, or it is organized on a single sourcing base, as a transnational production network. In the first case, the factory, the suppliers and the markets are very close to each other. In the latter case, distances separating each of them are much longer.

Beyond technology and demand determining the organization of production, product *characteristics* will have a key importance in the definition of the firm's *global logistics strategy*. Chiefly, the product's *value density*, *i.e.* its market value in relation to its weight and volume, will induce firms to have very localized logistics systems in the case their product has a low value-density. Of course, this is the case for bulk products such as cement or limestone. But manufactured products such as washing machines,

refrigerators, also require strongly localized logistics systems. Conversely, high value-density products such as digital video cameras are manufactured in a very small number of facilities and are shipped worldwide, even via aircraft[1]. Therefore, global logistics strategy can be sketched according to the 'logistics reach' , as developed by Cooper, (op. cit. p15) of the products considered.

The *logistics strategy* will consist, assuming a given international production network[2], of the permanent monitoring of production costs and their measurement against transport costs, in optimizing customer satisfaction (lead time), volumes sold and profit margin.

For logistics cost and time reduction, manufacturers tend to focus their effort on incremental improvements to operational aspects such as transport and warehousing. By doing so, not only it becomes increasingly difficult to achieve further significant savings over time : the attention is diverted from improving the efficiency of the whole chain. For example, Walker (1995) reveals that, in a study done by a leading European manufacturer, the time required to capture and process an order was five times longer than the finished goods' transit time. Clearly, this shows that not only the efficiency of physical distribution is at stake, but that manufacturer's *internal organization* of information circulation and decision making is a key factor in logistics performance.

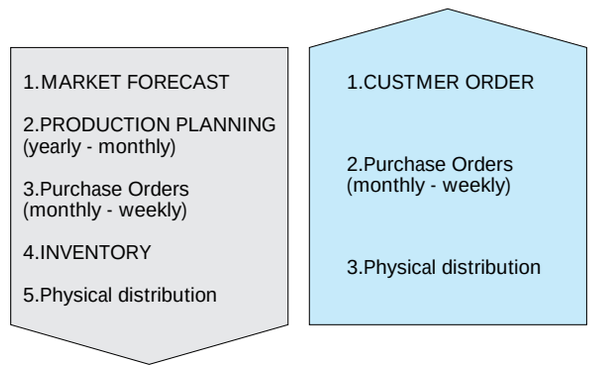
From integration of information flows....

By extending tremendously the distances between the markets and the factories, the internationalization of production networks has introduced rigidities in the physical flow of goods. Therefore, multinational companies have implemented extensive technologies (EDI, UPC, VANS and EPOS[3]) for a leaner *information chain* (Christopher, 1971) allowing rapid order processing, accurate production planning and just in time inventory management.

The firms have implemented 'multi-country' consolidation systems where sales data are consolidated and processed to provide the supply chain with production planning data. Extensive use of computer technologies and telecommunication networks allows a better knowledge of markets' fluctuations.

... to supply chain reengineering.

But again, incremental improvements in production planning and information flows integration are bringing less and less significant gains over time, as long as the inventory management system itself is not changed from a 'make to stock' system - or push system - where goods are manufactured in anticipation of future demand and stored downstream, to a 'make to order'- or pull- system where inventory is "pulled" by customers' actual demand.



■ **Exhibit—2 " Push "versus" Pull "inventory Management systems.**

As the above exhibit suggests, multinational companies remain *functionally*-based organization, with a central role for the Marketing and Production departments, resulting in fragmented responsibilities for logistics matters. The restructuration of the supply chain management towards a *pull* system requires to emphasize the importance of *processes* such as customer order fulfillment and cash flow optimization. The supply chain reconfiguration shall challenge highly formalized organizational structures and be oriented towards the optimization of processes initiated by the customer's requests.

Simultaneously, through the diffusion of information systems among the firms and its partners (transporters, suppliers), parts of the supply chain can be easily decoupled from the rest of the chain and be outsourced to be carried out by external actors.

Fundamentally, a push-type production system is based on forecasts of demand ... goods being manufactured before being actually ordered, they have to be stored in inventory. Conversely, the pull system aims at producing the exact amount of products actually ordered. Due to the usually long transport times in international supply chains, the techniques of postponement and product standardization are the most frequent way for manufacturers to implement demand-pulled inventory management systems.

3——Logistics strategy: towards outsourcing?

The purpose of supply chain management is to minimize the value of unsold items and minimize lead times along the chain. The standardization of the product's design allows to postpone the point in the chain when the *product is allocated to one given customer*. Delaying customization increases the company's flexibility towards market changes while reducing inventories.

Postponement techniques are rooted in inventory management and mean leaving to the *latest possible moment the decision on how to configure products for particular customers* (Cooper 1995, p52). These techniques are therefore more efficient if the product is designed in modules (for a laptop for example, keyboard, screen, motherboard, microprocessor).

Very naturally, the idea of *postponing* (Buckling, 1965) induces the decision of outsourcing or not. As one essential aspect of *just in time* production, the logic of postponement consists of minimizing the inventories owned by the firm, either by improving the efficiency of production planning, or by outsourcing the financial responsibility of such inventories. Firms therefore have to address the possible involvement of third parties in the distribution and materials management stages of the supply chain, as well as in manufacturing or assembling activities contributing to minimized inventory of *final* products. It is of course common practice to outsource logistics activities such as *inventory keeping* to specialist companies, but suppliers and customers (department store chains...) might also get involved in the management of information and/or physical flows[4)].

Impact of postponement strategy on the transport industry.

As the manufacturers' experience of international production increases, they may switch to local sourcing and worldwide distribution, like Sony, which reorganized from an 'invader'[5)](Cooper, op.cit.) system in the 1970's to a 'settler'[6)] type in the 1990's. An increasing number of manufacturers choose to rely on *global logistics partners* (French Geodis for IBM, UPS worldwide Logistics for others[7)]...) for carrying out such changes in distribution and sourcing practices.

Therefore, the challenge for these logistics partners will be to provide a wide range of services on a worldwide scale and with high level of performance (time, reliability, cost...). This requires the ability to coordinate a global system including *internal resources* (consolidation and distribution centers, information processing) as well as *external suppliers* (plain haulage service...).

Simultaneously, the adoption of postponement techniques such as delayed configuration of finished products would result in many cases in a *reduced dependence on plain transport*, since only the goods *actually* ordered by the clients would be shipped.

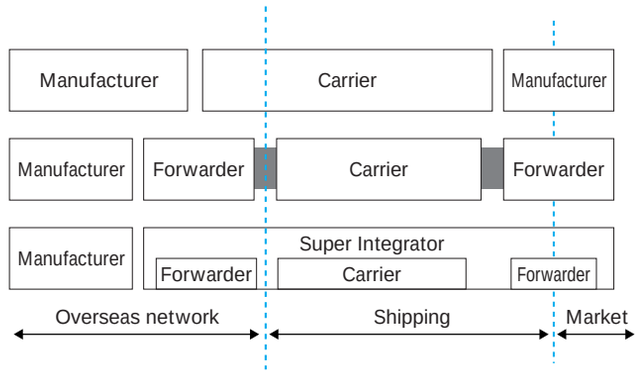
4——Involvement of the transport industry in international logistics.

The generalization of lean production methods among manufacturers and their suppliers have changed the way supply chains are managed. Shipments are of smaller size, more frequent in order to feed a *make to order*-oriented chain, while previously, full-container loads (FCL) were shipped. The shrinking size of shipments and increased frequency of shipments makes it difficult for manufacturers to

realize economies of scale. Only worldwide manufacturers with significant cargo flows like Sony address the transport cost issue by seeking attractive prices directly from carriers in exchange for cargo volume commitments.

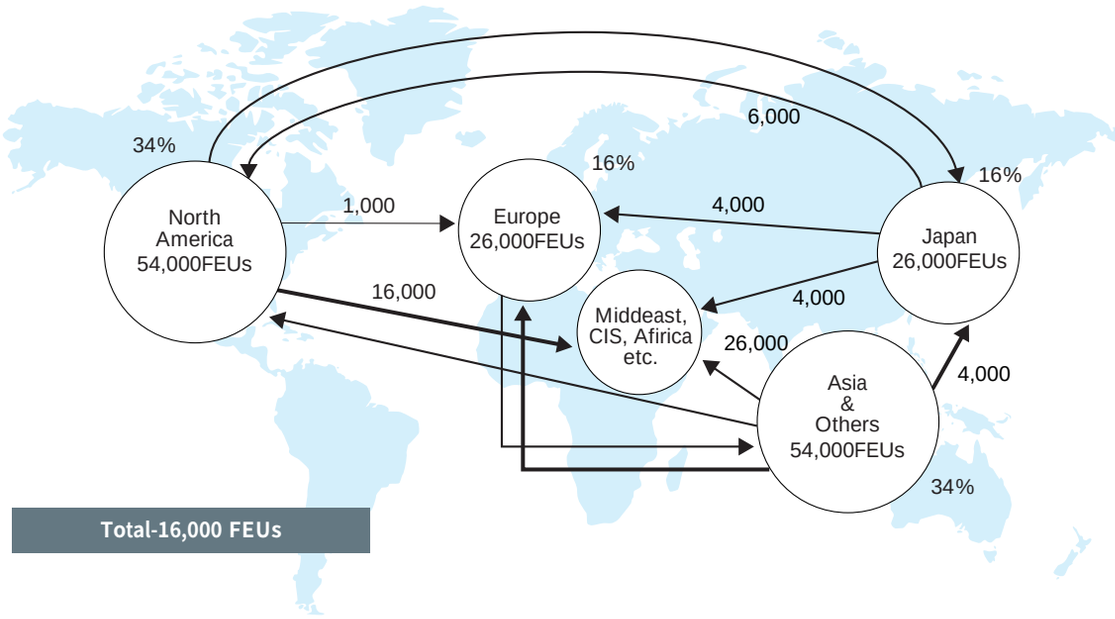
A distinction can be made among viable transport networks between *point to point, multi-stop, transshipments* and *hub & spoke* networks. Point to point networks are regular and fixed line haulage of mostly FTL[8] transport units between predetermined origins and destinations. Multi-stop - or 'milk run' - type networks mostly consist of LTL transport units between fixed but multiple points. Such networks are well adapted to just in time production systems. In *transshipment networks,* transport is carried out on multiple lines from a central transport center, via mainly LTL[9] consignments. Consolidation is done at transshipment points. Finally, in hub & spoke systems, at least one giant transport center is specialized for large volume and high speed transshipments, in large cities or for international logistics.

Among the multiple degrees of outsourcing of the international supply chain management, one can outline three major scenarios, according to which actor is playing the dominant coordination role in the flow of informations and goods.



■**Exhibit —3 scenarios for International supply chain coordination.**

In the first case, as shown in the above exhibit, manufacturers with large volume of international cargo, if aware of the economies of scale incurred by physical distribution, may choose to keep in house key logistics tasks and to negotiate long term shipping contracts directly with carriers[10]. In other terms, in this scenario, with very limited outsourcing of logistics functions, the manufacturer can achieve a strong control over the chain and manage transport services suppliers as plain commodity providers.
The second scenario gives a key role to international freight forwarders in the coordination of



■**Exhibit— 4 SONY's international cargo volumes[11].**

international chains. Particularly forwarders endowed with extensive global network can supply a large range of service to manufacturers not prepared to bear the costs of dedicated networks. The completion by forwarders of these networks requires the formation of cooperation alliances such as Cargo 2000 aimed at sharing resources such as aircrafts and ground handling facilities. Provided recent malfunctions in such alliances[12] are solved, their importance in the industry of international supply chain management will rise.

In the third scenario, integrators like UPS, Fedex or DHL, already providing door to door services on a global scale and having a long experience of transporting small size consignments, are in the process of improving their edge in order to become "superintegrators", that is enlarging the range of services in all the transport modes by resorting to subcontractors (carriers, forwarders...).

It therefore appears that outsourcing is not always the most effective and economical solution for a manufacturer willing to improve its international supply chain management and depends on the manufacturer's international flows of cargo and awareness towards logistics strategy definition.

The stake for these integrators is to get rapidly in a position to offer a complete range of logistics services to serve the largest possible share of new markets born with e-commerce, in the fields of supply-chain management (the so-called business to business) as well as final distribution of goods ("*business to customer*"). Depending on the actors considered, the forms of ownership chosen will either be mere alliances, or ownership, partial or complete.

5——Conclusion

The transport industry is now in the process of frenetic reorganization via mergers and alliances to enlarge the geographical availability of a permanently increasing range of services. But private actors of the transport industry might not be capable to fully address the coming demands of manufacturers. Among several issues, electronic commerce will provoke a spectacular increase in the volume of international small parcels consignments.

The customs departments of even the most developed countries being equipped to process larger consignments, the surge in import of small parcels will fatally result in congestion problems, which even the largest logistics companies cannot address. Governments have a key role to play in anticipating such issues, and more generally in ensuring a balanced availability of transport and logistics services across their territories.

The generalization of just in time production methods along with their matured experience of international production networks brought manufacturers to revise the organization of the physical flows of works in process and finished goods, so that global markets can be served while minimizing the risk of unsold items.

To that end, they had to reconsider the distribution of responsibilities between the headquarters and operational units located closer to the markets and production systems. Progressively, decisions relative to production planning and logistics management are taken over by decentralized units, while information technologies still provide strategic monitoring data to the headquarters. The following stage in the redistribution of responsibilities in international supply chain management consists of the decision to outsource the whole or simply parts of logistics management to third parties, particularly the transport industry. The purpose is not so much for these actors to increase their share of the existing market for supply chain management and final distribution. The stake is for the transport actors to remain competitive in radically new markets by being capable to address the complete range of transport and logistics services requested by manufacturers. More radically, they should aim at a completely new category of clients : the multitude of small firms with limited experience - if any - in the physical distribution of their products, willing to extend their reach by using electronic commerce.

Note

1) "Sony Seeks Global Contracts", American Shipper January 1998 Page 35-36.
2) i.e. the location of factories and suppliers remaining unchanged.
3) Electronic data interchange, Universal product coding, Value added networks, Electronic point of sale.
4) Packaging, product wrapping, final assembly, final configuration (computers), labelling, adding documentation.
5) establishing plants to serve local markets while sourcing components from Japan.
6) sourcing from a variety of countries and the finished product being sold in many countries.
7) "Getting close to the customer", Logistics Management & Distribution Report, March 1998, *http://www.manufacturing.net/magazine/logistic/archives/1998/log0301.98/03.air.htm*
8) Full truck load.
9) Less than truck load.
10) If actual volumes fall short of commitments, Sony pays a penalty to the carrier.
11) "Sony Seeks Global Contracts", op.cit.
12) "Air freight gears up for the 21st century", Logistics Management & Distribution Report, May 1998, *http://www.manufacturing.net/magazine/logistic/archives/1998/log0501.98/05.scm.htm*

Bibliography.

Buckling LP (1965), Postponement, speculation and the structure of distribution channels, *Journal of Marketing Research*, Feb, p26-31
Christopher MG (1971), *Total Distribution*, Gower Press, Aldershot.
Cooper J (1993), Logistics strategies for global businesses, *International Journal of Physical Distribution and Logistics Management*, vol23 n#4.
Cooper J (ed.) (1994), Logistics *and Distribution Planning - Strategies for Management*, Kogan Page.
Cooper J, Peters M et al. (1995), *Supply Chain Dynamics and the Environment-a Study of 6 Industry Sectors*, Cranfield University, UK.
Huppertz, P. (1999), Market changes require new supply chain thinking, *Transportation and Distribution March*, p70-74.
OECD (1996), *Integrated Advanced Logistics for Freight Transport*, OECD Press, Paris.
"Sony Seeks Global Contracts", *American Shipper*, January 1998 pp35-36.
Van Hoek, R. (1999), Postponement and the reconfiguration challenge for food supply chains, *Supply Chain Management*, Vol 4/1 p18-34.
Walker M (1994), Quick response, the road to lean logistics. In Cooper J. (ed.) pp207-219.

（原稿受付　2000年1月6日）

国際ロジスティクス－製造業によるアウトソーシングの拡大と交通産業への影響

製造業の生産ネットワークの国際化により，流通やサプライチェーンマネジメントの形態がより複雑になっている．原料供給地，工場と市場は大きく離れ，また製品のライフサイクルも加速している．こうした事情のなか，製造業者はロジスティクスサービスを自ら行わず，アウトソーシングするようになった．多国籍企業が効率的にサプライチェーンマネジメントを行うためには，次の2つの再編が必要である．一つは製品や商品の流通の見直しであり，もう一つは流通過程における各主体者間（供給者，工場，顧客，輸送産業）の役割を再定義することである．これより，交通産業はロジスティクスサービスの統合化，新規サービスの採用，最終的なサービスの質に対する責任を負うこと等に取り組むであろう．ただし，交通産業にとってはインフラ整備の費用負担が増大する可能性もあると言える．

キーワード；**国際ロジスティクス，アウトソーシング，サプライチェーンマネジメント，**e-commerce

この号の目次へ　http://www.jterc.or.jp/kenkyusyo/product/tpsr/bn/no11.html