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Research Memorandum 1999 - 12

vrije Universiteit *amsterdam*



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Intermodal Freight Terminals: Marketing Channels and Transport Networks'

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Summary

The goal of this paper is to combine the current theory about marketing channels with combined transport and logistics in order to develop a customer-based and broadly applicable approach to the study of combined freight transport in Europe. Furthermore, this paper seeks to provide an analytical framework as a starting point for the analysis of the performance -in terms of quality- of intermodal freight terminals. Much of the current research on transport is based on a comparison of features of distinct transport modes and their **(dis)advantages**.

However, this approach presents a problem, because it fails to take into account the different combined transport solutions that are offered by carriers and terminals. This problem leads to the central research question of this paper:

Which opportunities do intermodal freight terminals offer for an efficient functioning of combined transport marketing channels?

We start the analysis with a description of the theory of marketing channels. This theory states that different types of flows employ in marketing channels (e.g. payment, ordering, promotion, etc.). All these marketing channel flows are, in principle, customer driven. Next, we look at the central position taken by intermodal freight terminals in combined transport marketing channels. Finally, our analysis is combined in a new approach towards combined transport and logistics, named *cogistics*. Cogistics is the management of marketing channel flows from the point of origin (production) to the point of final consumption, in accordance with customer requirements and focused on using combined transport to the maximum extent possible. Opportunities that terminals offer for an efficient functioning of marketing channels are:

- focusing on solutions that are customer driven
- facilitating extensive communication between marketing channel members
- co-ordinating an efficient marketing channel organisation
- choosing the right marketing channel partners
- introduction of marketing channel commitment, trust, and co-ordination
- equally sharing of benefits.

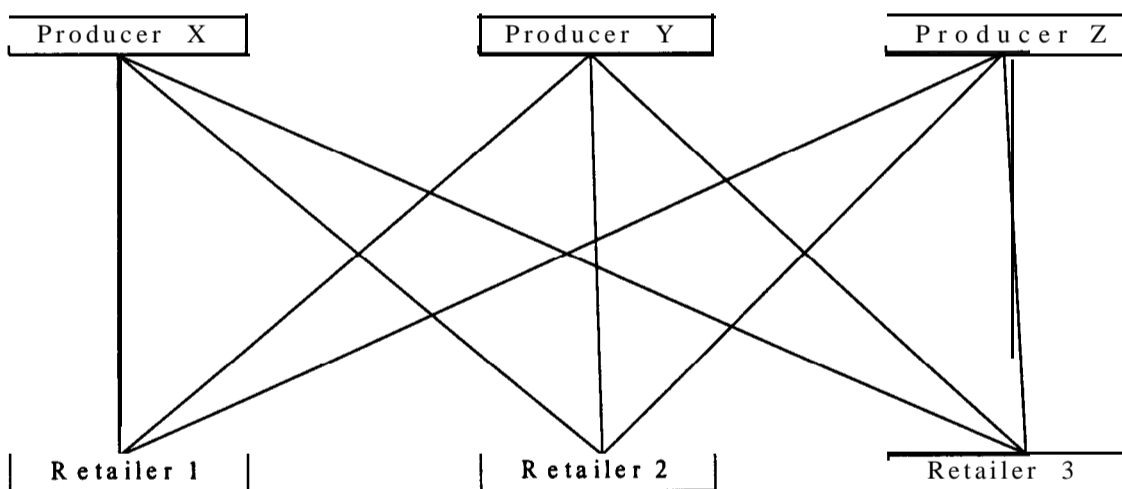
Table of contents

<i>1. Combined transport: a new perspective</i>	<i>1</i>
<i>2. Marketing channels: a review</i>	<i>2</i>
<i>3. Terminals and networks</i>	<i>5</i>
3.1 Introduction	5
3.2 Economic performance of terminals: an illustration	8
<i>4. Cogistics</i>	<i>12</i>
4.1 Logistics	12
4.2 Combined transport	13
4.3 Cogistics; logistics focusing on combined transport	14
4.4 The role of information	15
<i>5. Conclusion</i>	<i>16</i>
Literature	17
Internet sites	18
Appendix 1: Number and percentage of terminals for combined transport in EU countries.....	19
Appendix 2: Financial performance of the terminal sector in the Netherlands.	20

1. Combined transport: a new perspective

The increasing interest in combined transport as an alternative to unimodal road transport has heightened the need for research in this field. In the combined transport chain a central position is claimed by the intermodal freight terminal that tranships the containers between truck, rail, ship and/or barge. Over the centuries there have been many examples of a structural change in the relative importance of transport modes (Nijkamp and Vleugel, 1994). For example, in the Hanseatic period (thirteenth to sixteenth century) barges and coastal freight transport emerged as new logistic systems. In this period cities that were centrally located near the big rivers in the North of Germany and the North-east of the Netherlands co-operated in trading and shipping. The Golden Age (the seventeenth century) can be **characterised** by a drastic growth in deep-sea freight transport caused by **colonisation**. During the Industrial period (from about the middle of the eighteenth century till 1945) railways emerged as a new transport mode facilitating the development of mass production. After 1945 the period of **internationalisation** started, marked by a unprecedented increase in freight transport by road at the expense of railways, as a result of a clear customer focus. From the beginning of the twenty-first century we may expect to see an increase in combined transport, making an optimal use of existing transport networks, and facilitated by the great many possibilities offered by the Information period (1990 and beyond). As a result, we have seen the emergence of several new modes, but the synergy between these modes has never been fully exploited.

Much of the current research on freight transport is based on a comparison between different transport modes and their related **(dis)advantages** (Bithas, 1996 and Jourquin, 1997). However, this approach presents a problem in the sense that it fails to take into account the synergetic spectrum offered by combined transport solutions provided by transport carriers and terminal operators. A simplification of the traditional unimodal approach is found in Figure 1.1. The lines in Figure 1.1 represent freight flows. In this example, each marketing channel member (6) has numerous contacts (3) throughout the channel with all sorts of transport actors.



• Figure 1.1. Independent freight flows between all channel members

The differences between the various combined transport solutions need to be analysed more thoroughly so as to provide insight in the full potential that is offered by combined transport services. The aim of the present paper is to give a network-embedded approach to intermodal freight terminals. For this purpose we use the marketing channel

theory in order to present a refreshing new view on combined transport, including the use of intermodal freight terminals. This brings us to the central question of this paper:

*Which opportunities do **intermodal freight** terminals **offer** for an **efficient functioning** of combined transport marketing channels?*

The remainder of this paper is divided into four sections. Section 2 will describe the theory of marketing channels which will form the basis of our analytical framework. Section 3 then deals with terminals and transport networks in general. Next, the fourth section introduces our new approach to combined transport and logistics, named **cogistics**. The final section contains the conclusion of this paper.

2. Marketing channels: a review

In this section we will introduce the marketing channel analysis as a useful framework for investigating operations of freight terminals. A marketing channel is a *superorganisation* comprising interdependent institutions and actors involved in the task of making products and services available for consumption by end-users. An example of three important marketing channel members in a marketing channel relationship is shown in Figure 2.1.

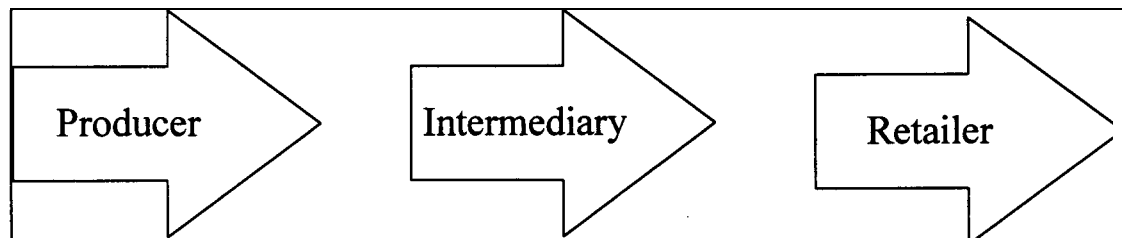


Figure 2.1. Three important marketing channel members

A marketing channel starts with customer needs, whose **fulfilment** results in customer satisfaction. Each channel begins with customer needs, which may result in freight flows to the producing company. Following the production process, the products are transported to wholesalers who distribute the products to retailers. Finally, products are bought by customers and (hopefully) this results in customer satisfaction. It is assumed that customer needs are the basic determinants of all marketing channel movements, including the freight transport flows. Production is then also based on the needs of people, followed in the end by consumption, which results in customer satisfaction (Takada, 1998 and Inamura, 1997). It seems even plausible to assume that all marketing channels and transport networks are customer driven. The reflecting patterns of freight, payment, and other marketing channel flows are subject to permanent change and adjustment. This suggests that incidental and more trend-wise changes may occur in networks -including terminals- that facilitate the flows of goods and services (Priemus et al., 1994). This customer-oriented approach implies that marketing channels and networks should optimally and flexibly serve the customer.

Generally, numerous actors are involved in the marketing channel **from** customer need to customer satisfaction. In such channels all sorts of marketing channel flows are running between the different actors in the channel. In Figure 2.2 we selected two marketing channel actors and the main channel flows. This figure also clarifies the links to the logistic approach; the management of the flow of materials and products from source to customer. An intermediary can be one of the following companies: distribution company, wholesaler, shipper, stevedore, logistic company, ship-broker, forwarder, warehousing company, trading

company, **groupage** company, ship-owners, transport company (rail, road, barge, short-sea), and expedition company.

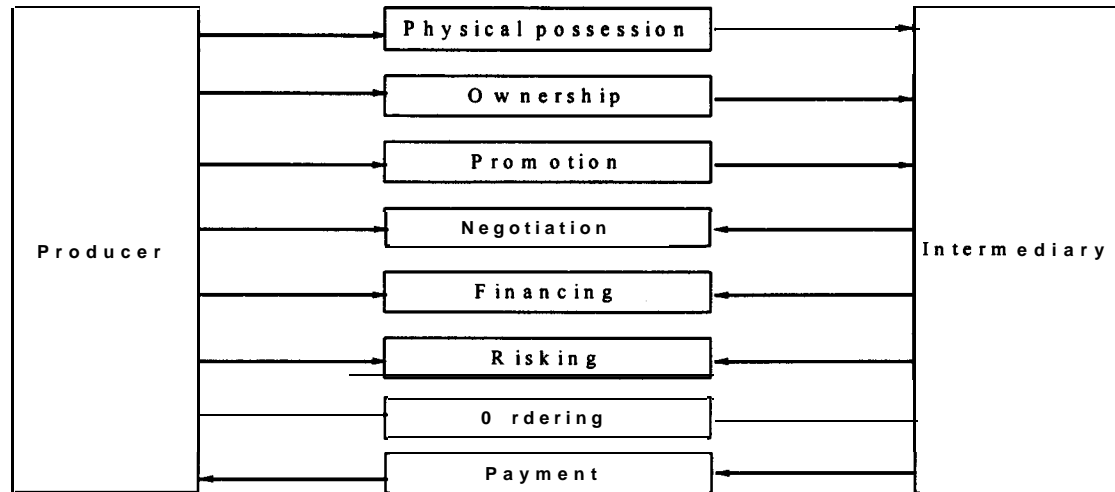


Figure 2.2. Marketing flows in a marketing channel
(Source: Stem, 1996)

A marketing channel structure is a combination of a set of institutions, actors and establishments through which a product or service must move to reach the industrial users or the final consumers. Usually, several actors join forces in complex channel arrangements. The channel should be viewed as a network that creates value for end-users by generating form, possession, place and time utilities (Magee, 1985). In general, physical possession, ownership and promotion are typically flows that are aimed in a forward direction **from** producer via intermediaries (wholesaler/retailer) to consumers. Negotiation, financing, and risking flows move in both directions. Risking has to do with profit opportunities that are realised by taking risks. Ordering and payment flows are aimed in a backward direction. With financing flows we mean transfers of ownership which induces inventory holding costs.

The use of combined transport, including the use of intermodal freight terminals, will only be successful if such marketing channels are completely customer driven. Furthermore, communication between combined transport marketing channel members is another important prerequisite for a successful implementation of combined transport. In addition, a situation of many actors in a channel all striving individually for maximum profit may prevent a profitable and flexible functioning of the marketing channel as a whole. Up till now many relations in the combined transport channels in the EU countries are based on a competitive model in which many actors are involved without seeking co-operation. For example, terminal users generally perceive terminal services to be inadequate, whereas terminal operators are mainly interested in filling capacity and/or minimising costs. These different perceptions often lead to marketing channel conflicts. A competitive channel conflict is a situation in which one channel actor perceives another channel actor to be engaged in behaviour that prevents (or impedes) it from achieving its goals. The amount of channel conflicts is, to a large extent, a function of goal incompatibility, competence domain issues, and different perceptions of reality. The characteristics of channel conflicts depend in general upon:

1. intensity of channel conflicts
2. frequency of channel conflicts
3. importance of channel conflicts.

These reflections about transport channel conflicts immediately lead to questions about channel power and property rights. Channel power is really based on the possession and control of resources that are valued by another party in the marketing channel. Terminal

operators have some channel power, based on their transshipment equipment, but the real power of a channel member lies in its ability to control the decision variables in the strategy of another channel member involved in a given channel. For this control to qualify as market power, it should differ from the influenced channel member's original level of control over its own strategy. Thus, market power is more than the original level of control of the influenced channel member. Dependency and market power are inseparable. If, for example, A is dependent on B, then B has power over A. According to Stem (1996, p. 288-300), bases of power are:

1. Reward power
2. Coercive power
3. Expert power
4. Reference/identification power
5. Legitimate power.

Rewardpower is based on the belief by B (terminal customers) that A (terminal operator) has the ability to grant rewards to B. This base of power may be used by individual channel members and includes, for example, the granting of wider margins, the allocation of various promotional allowances or other compensation elements, functional discount schemes, and the assignment of exclusive territories. For example, large shipping companies are rewarded with lower container handling tariffs at the ECT-terminal in Rotterdam. How can this terminal afford these discounts? The ECT-terminal knows how important capacity filling is and hence that large shipping companies are extremely important. Research has shown that monetary compensation is a key element of reward power in co-ordinating channel activities (Stem et al., 1996, p. 289). The right level of compensation in this context is taken as the equity principle or value based compensation. Rewards are given on the basis of each channel member's contribution to the generation of relevant outputs in the marketing channel system: which costs has each channel member borne in performing channel functions, and which value has been added by each channel member to the total channel system? In the absence of "hard" objective cost data an alternative is to calculate the percentage of the total available (transport) budget we would have to allocate to the different functions to get the job done.

Coercion involves any negative sanction or punishment of which a firm is perceived to be capable. Examples are reductions in margins, the withdrawal of rewards previously granted (e.g. an exclusive territorial right), and the slowing down of shipments. Coercive power is usually less functional in the long run and therefore it should only be employed if all other options have been tried. This power base may be perceived as the opposite of reward power. Terminal operators are using coercion towards small shipping companies and small transport businesses. These companies represent only small parts of capacity, which means a lower priority in the transshipment process. In the short run this may be profitable for the terminal operator, but over the long run it may be less functional than other power bases. For example, it may cause customers to change terminal operator.

Expertpower is based on actor A's perception that actor B has special knowledge. Generally, terminal operators are not considered by their customers to have special knowledge, except for transshipping and handling load units. Crucial to the retention of expert power is the ability of a channel actor to position himself well in the communication and information flows within channel systems. In this respect, particularly the introduction of IT in marketing channel operations may cause the instalment of expert power for terminal operators.

Referent/identification power has its basis in the identification of actor A with actor B. It is obviously clear that, generally speaking, the combined transport service element delivered by the terminal operator will not help to increase trust in terminal operators and thus that no identification will result. Consider, for example, a company which is simultaneously offered an unimodal road transport service and a combined transport service,

including the use of an intermodal freight terminal. All other things being equal, most companies will prefer the unimodal road transport service. Thus, intermodal freight terminals will have to create referent power by themselves. Trust is a major prerequisite to build this power base.

Legitimate power is based on a perception of a formal hierarchy of authority. Actor A has a feeling that actor B should or has a right to exert influence and A has an obligation to accept it. Channel hierarchy determines for an important part if a certain channel member has legitimate power. Because, freight terminals have a low **channel** hierarchy; these actors thus will have almost no legitimate power. Channel hierarchy of the different actors depends on their costs, benefits and shared values. However, the channel hierarchy is more likely to favour the customers of terminals, because terminals are merely there to serve shipping companies and transport carriers.

If in a channel structure power is more equally balanced, the chances of successful channel co-ordination are greater. Maximising channel productivity is about marshalling resources to make the channel design work. This depends on:

1. Right marketing channel design
2. Choosing the right marketing channel partners (e.g. those with the same business goals)
3. Marketing channel commitment and co-ordination (e.g. sharing costs and benefits).

When designing channels one should keep in mind that physical transport is just one element out of a set of functions performed by channel members. A complete marketing channel is a set of functions (flows) performed in sequence by channel members.

3. Terminals and networks

3.1 Introduction

The goal of the **EU** countries is to increase the importance of combined freight transport. Combined transport tries to merge services of distinct transport carrier types to improve overall physical distribution performance of freight movements, thereby achieving less costly solutions and wider access to product markets and supply sources. A carrier is a transport company that transports freight for an intermediary or a producing company. The carrier may either use a terminal or provide unimodal direct transportation. When using combined transport, efficient and co-ordinated use of transport networks is very important (**Capello** and **Nijkamp**, 1993). A central place in combined transport channel networks is taken by freight terminals. According to **Stern et al.** (1996) a **decentralised** transport system is less efficient than a **centralised** network that uses transport intermediaries (e.g. carriers or terminal operators). These transport intermediaries can considerably reduce the number of transactions and thus costs (**Raesfeld**, 1997). Other advantages are minimisation of assortment discrepancies, routinisation, and facilitation of search procedures. The position of intermediaries and other marketing channel members is illustrated in Figure 3.1.

- According to **Magee** (1985) and **van Klink** (1995) intermediaries increase the efficiency of the flow of goods by creating utility elements of place, possession, time, and form. The intermediary in the combined transport marketing channel could very well be an intermodal freight terminal. If the intermediary is a terminal operator, we may expect the following advantages in marketing channel operations:
- i) the terminal operator is relatively neutral towards the use of each transport mode;
 - ii) the terminal operator is more flexible in choosing the most efficient transport service;
 - iii) the terminal operator is in a better position to accumulate freight flows;
 - iv) the terminal operator is more likely to choose an environmentally friendlier transport mode.

In general however, most terminal operators are working with outdated equipment and are only interested in filling capacity and/or minimising costs. In contrast, a carrier as

intermediary has the important advantage of a better understanding of customer needs. Still, transport solutions offered are usually restricted to one transport mode; there is only one option offered (no alternatives), while fewer opportunities for accumulating freight flows are available.

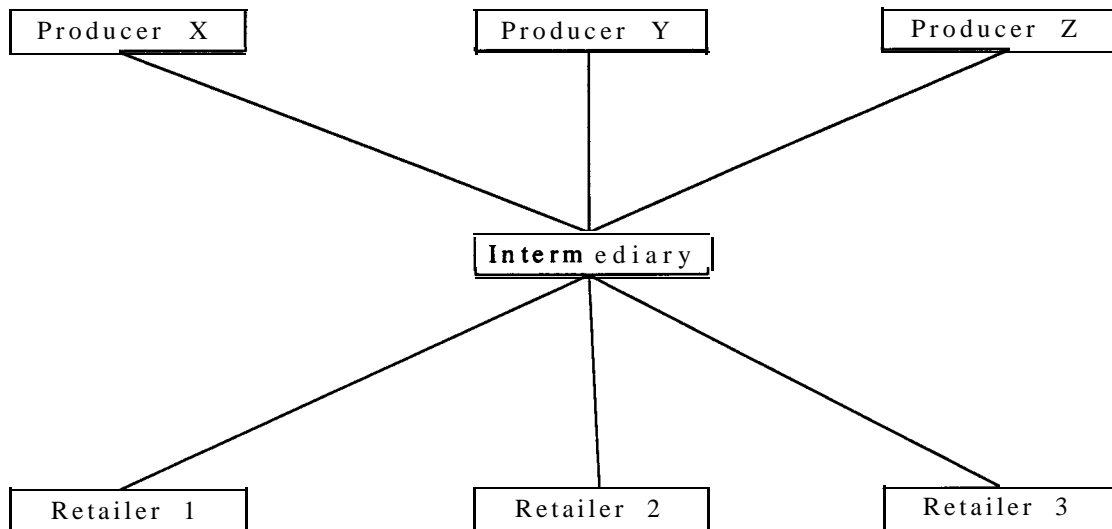


Figure 3.1. Linked physical transport channels between producers and an intermediary and between retailers and the intermediary (seven actor, 6 transactions)

It is argued that room for an intermediary exists if the transaction costs are higher than the cost of co-operation. Thus if the introduction of an intermediary (which requires co-operation) leads to lower overall costs for marketing channel transactions, it could be done successfully. Advantages of strategic channel co-operation are cost spreading, risk reduction, time reduction, scale effects, synergy, competition reduction, opportunities to **specialise**, and increase in flexibility and access to markets. However, disadvantages of strategic co-operation are cultural differences, reduction in freedom, time consuming procedures, communication problems, profits division, and manageability. Currently, in combined transport operations the disadvantages outweigh the advantages, which results in marketing channels that do not function as **efficiently** as they could.

These reflections about the position of intermediaries in marketing channels lead to advantages that may be derived from combining marketing channel activities. Usually, total cost of delivering products and services to end-users is lower when two (or more) actors in a marketing channel combine their activities (intermediary) than when they undertake these activities separately. Advantages of combining marketing channel activities are, inter alia:

1. A decline in total channel costs
2. Improvement and increase of channel output
3. Reduction in warehouse space and costs
4. Higher reliability
5. Reduction in mistakes
6. Lower stocks
7. Reduction in total channel time
8. Increase in keeping qualities of products and thus a decrease in writings-off
9. Fewer empty shelves
10. Fresher products in the shops
11. More satisfied customer.

In order to be able to realise these savings we have to develop full insight into the relationship between the different marketing channel members. In this section we focus on the relation between terminal operators and terminal customers in the combined transport

channel. The flows in Figure 3.2 (incoming) and 3.3 (outgoing) can be seen as an extended version of the marketing mix of product, price, promotion, place, people, and process. Physical transport operations are usually derived demand, whereas terminal operations are even derived demand **from** derived demand. This may imply that channel actors in combined transport are generally not involved in many marketing channel flow functions. Carriers and terminal operators do have physical possession which creates possession utility, as they are transporting or handling freight. Payment flows run, in principle, from customers (e.g. carrier) towards terminal operators. Communication, negotiation, process, risking, and people are all flows that run both ways in transport marketing channels. In this respect, time utility is created by the process and communication flows. The product or service flow runs from terminal operator towards a carrier and represents the delivered service (e.g. transshipment) by the terminal operator. This service delivered by the terminal operator creates place utility. If terminal employees (people) perform their jobs well, they may create form/function utility. Next, Figure 3.3 shows the outgoing flows that run between terminal operator and carrier. Physical possession changes from terminal operator to carrier. The carrier pays the operator for the service delivered. Negotiation about the price requires two parties. The perception of a marketing channel as part of a complex process is required for both parties and should be accompanied by extensive communication.

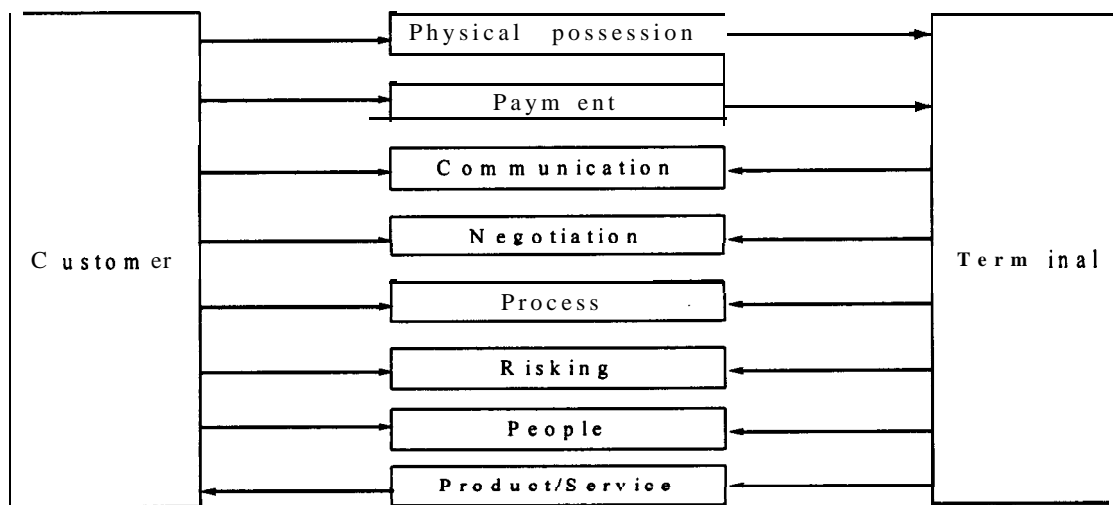


Figure 3.2. Marketing channel between carrier and terminal operator; incoming flows.

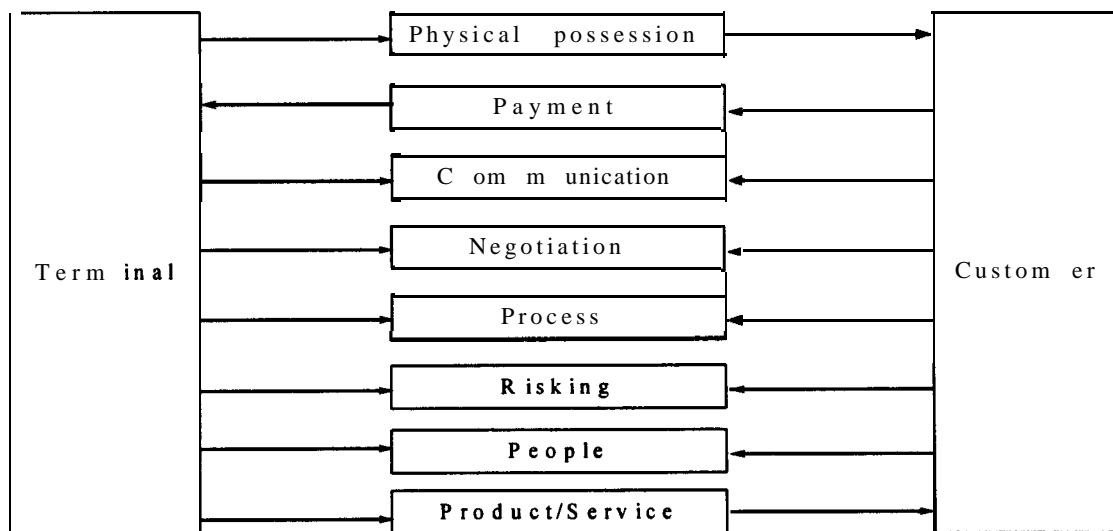


Figure 3.3. Marketing channel between terminal operator and carrier; outgoing flows.

3.2 Economic performance of terminals: an illustration

Terminals are used either out of necessity (change of transport mode) or because solutions including the use of a terminal offers more quality, better time performance, and/or lower total channel costs. Combining terminal customers and freight flows results in the following matrix.

		Terminal Customers	
		Paying	Non-paying
Freight Flows	Incoming	Shipping companies	Transport carriers
	Outgoing	Intermediaries	Transport carriers

Figure 3.4. Terminal operator; customers and freight flows.

This matrix distinguishes between paying and non-paying customers. Especially the shipping companies are important for the terminal operator as the main source of revenues and freight flows. Non-paying customers are concentrated among the transport companies. If we concentrate on the incoming freight flows we observe that large shipping companies provide the main freight flows. This matrix is constructed in order to provide insight into the different types of terminal customers. Between the terminal operator and its customers run the marketing channel flows. Not all terminal customers will have the same contacts with the terminal operator. These contact points then represent the different flows that are running between operator and customer, and it may give some indications for the creation of utility. Generally, terminals are not perceived as a chance to facilitate a more efficient operation of marketing channels. But terminal operators may be very well organisers (intermediaries) of marketing channels. It is interesting then to investigate -as an illustration and starting point- the added value (payment flow) of freight terminals as intermediaries for the moment. In this study the financial performance of the terminal sector in the Netherlands is used as a case study to provide some insight into performance characteristics of freight terminals. All amounts are changed from guilders to Euro's (€) and based on <http://statline.cbs.nl>.

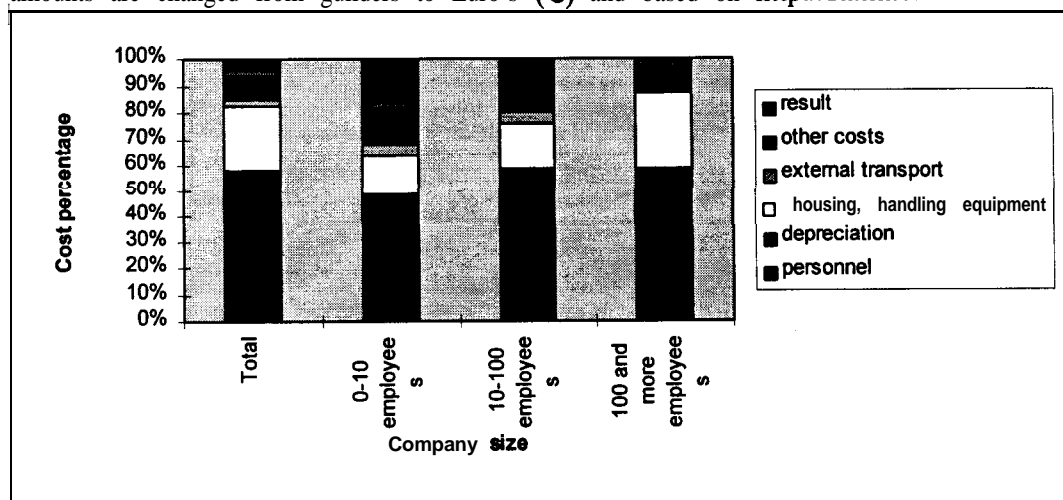


Figure 3.5. Cost structure according to terminal size.

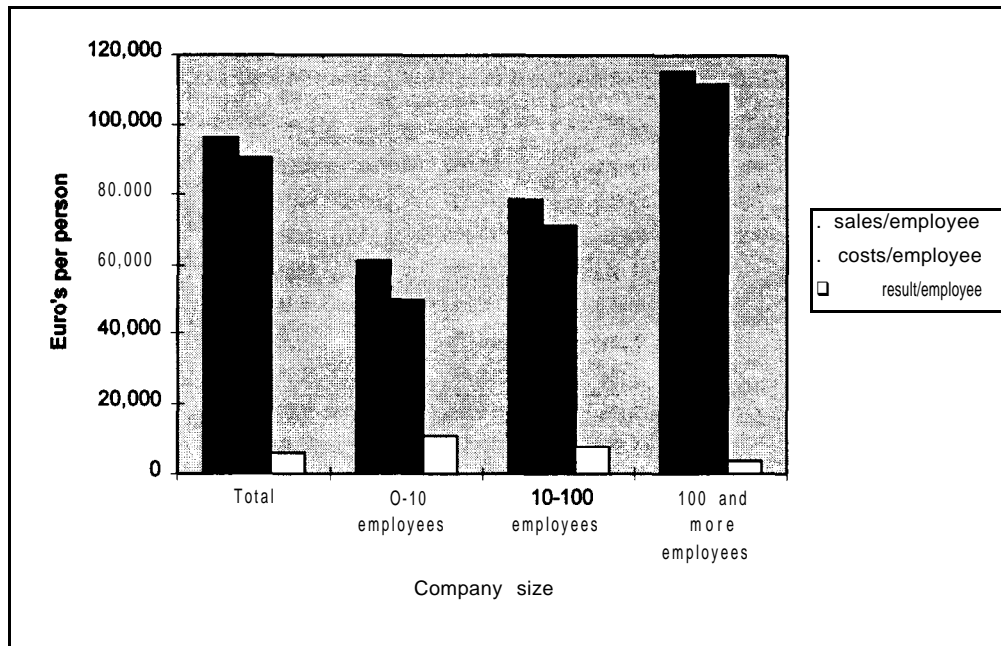


Figure 3.6. Key-performance per employee according to terminal size.

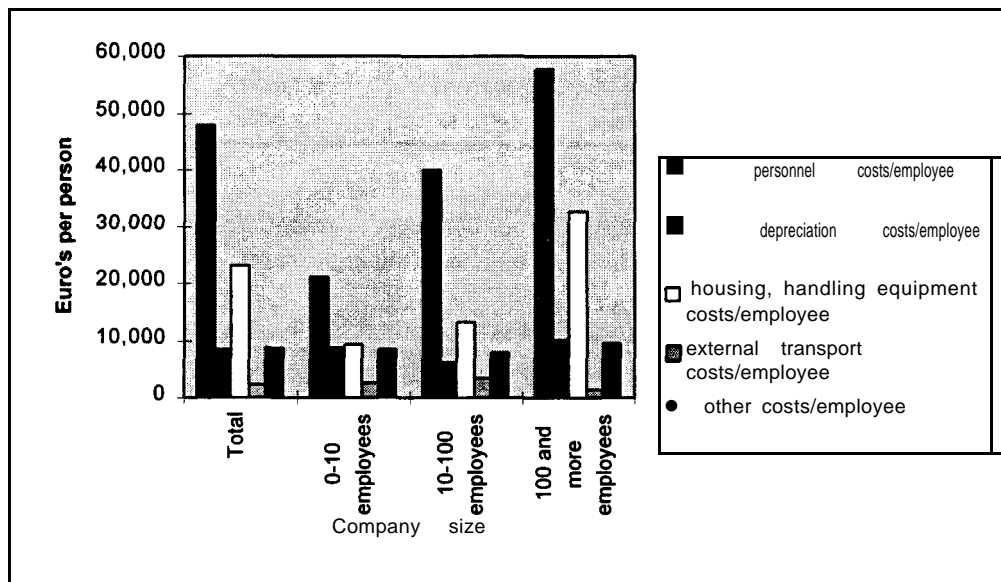


Figure 3.7. Performance per employee according to terminal size.

Table 3.1. Loading, unloading, and transshipment activities (1996); financial results.

	Total	0-10 employees	10-100 employees	100 and more employees
employees	37	5	40	368
sales (€)	3,562,293	305,069	3,147,797	42,472,761
costs	93.9%	82.0%	90.3%	96.7%
• personnel	49.6%	34.5%	50.9%	50.1%
• depreciation	8.8%	14.1%	8.0%	8.8%
• housing, handling equipment	23.9%	15.2%	16.9%	28.3%
• external transport	2.4%	4.2%	4.3%	1.2%
• other costs	9.2%	14.0%	10.2%	8.3%
result	6.1%	18.0%	9.7%	3.3%
net result	5.1%	15.0%	9.0%	2.4%
personnel cost/FTE (€)	45,950	30,317	38,844	51,634
sales/FTE (€)	105,637	74,372	91,900	118,427
sales/employee	€ 96,278	€ 61,013	€ 78,695	€ 115,415
costs/employee	€90,405	€50,031	€ 71,062	€ 111,606
personnel costs/employee	€ 47,754	€ 21,050	€ 40,056	€ 57,823
depreciation costs/employee	€ 8,472	€ 8,603	€ 6,296	€ 10,157
housing, handling equipment costs/employee	€ 23,010	€ 9,274	€ 13,299	€ 32,662
external transport costs/employee	€ 2,311	€ 2,563	€ 3,384	€ 1,385
other costs/employee	€ 8,858	€ 8,542	€ 8,027	€ 9,579
result/employee	€ 5,873	€ 10,993	€ 7,633	€ 3,809
net result/employee	€ 4,910	€ 9,152	€ 7,083	€ 2,770

 Source: <http://statline.cbs.nl>, September 1998

In Table 3.1 we can observe some average results per company segment. For the large companies we see high cost levels due to housing and handling equipment.

Table 3.2. Financial performance of the Rotterdam ECT-terminal in 1996 and 1997

ECT	1997	1996
sales (million €)	288,6	278,8
net profits (million €)	17,9	18,4
personnel	2,083	2,054
containers	2,5 18,000	2,358,000
TEU*	3,950,000	3,537,000
costs (million €)	264,0	252,7
personnel costs (million €)	142,2	141,3
sales/container	€ 114,6	€ 118,2
sales/TEU	€ 73,1	€ 78,8
sales/person	€ 138,550	€ 135,735
net profits/container	€ 7,12	€ 7,80
net profits/TEU	€ 4,53	€ 5,20
net profits/person	€ 8,593	€ 8,958
costs/container	€ 104,8	€ 107,2
costs/TEU	€ 66,8	€ 71,4
costs/person	€ 126,740	€ 123,028
personnel costs/container	€ 56,47	€ 59,92
personnel costs/TEU	€ 36,00	€ 39,95
personnel costs/person	€ 68,267	€ 68,792
TEU/container	1,57	1,50
containers/person	1,209	1,148

* according to ECT's financial statement 2,5 million containers is almost equal to 4 million TEU. This is stated in Nedlloyd's annual report to be equal to 3.950.000 TEU in 1997.

It is often claimed that prices imposed by freight terminals are high. However, there are several reasons suggesting that terminal service charges are not exceptionally expensive:

1. financial results of terminal operators are not extremely high (average 5,1%).
2. it is more important to look at terminal service charges from a marketing channel perspective. This is about costs fitting into combined transport channels as a whole.
3. the price/quality ratio is not well balanced. Terminals should increasingly strive for quality improvements instead of cost minimisation and capacity filling.

Freight terminals may be very suitable to combine interfaces, carriers, producers, and intermediaries into well-organised and well-equipped marketing channels in order to realise scale economies. The resulting quality of networks depends for a large part on the quality of interfaces (e.g. terminals). According to Tsamboulas et al. (1997), some quality criteria for terminals are ownership form, location, terminal area, political involvement, and transport modes served. Their research showed that 40% of a total of 70 questioned terminals are fully public and 60% had at least some extent of private ownership. Furthermore, 38% of the terminals were purely domestic (having all their connections in the country of their location) and 62% were partly domestic or mainly international (having at least one international link). Based on criteria such as physical area of the terminal and the size of investment, the terminals could be grouped into 47% small ones and 53% medium or large ones. Political approval for implementation of investments in infrastructure development or equipment acquisition is needed for 82% of terminals, and no approval for only 12% of the terminals. 93% of the terminals served road vehicles, 88% served railways, 46% were seaports, and 20% had inland waterway connections. Appendix 1 shows that indeed almost all terminals have road connections. 75 percent of the terminals have rail connections, 53 percent have sea access and just 10 percent of terminals have access to inland waterways.

Decision criteria were found to be minimisation of operating costs (31% or 22 responses) and maximisation of net profit (25% or 18 responses). These decision criteria are usually based on business goals. Minimisation of costs and maximisation of profits are mainly internal goals that definitely do not stimulate desired marketing channel efficiency. External impacts influencing investment appraisal were found to be attraction of new freight (31% or 22 responses), noise (15% or 11 responses), air pollution (15% or 11 responses), and diversion of lorries from urban areas (15% or 11 responses). However, attraction of new freight is linked with costs and profits and therefore is also an internal business goal. At the same time this is the most customer oriented variable found. The other three external impacts can be grouped into 'environment' and carry a high flavour of political involvement. Objectives of terminal investment were cost reduction/efficiency increase (23% or 16 responses), capacity increase/meeting demand (17% or 12 responses), and enhancement of status and role (19% or 13 responses). These objectives can clearly be linked with decision criteria. The last objective mentioned above is at least not very efficient and also seems to be a political goal.

The objectives of terminal operators can thus be stated as cost **minimisation/profit** maximisation, capacity oriented, and realising political goals (e.g. environment, enhancement of status and role). Usually terminal operators are not entirely clear about their customers, and therefore offer a broad package of functions for the sake of risk-spreading and widening the operating base (many potential customers). As yet not much **specialisation** can be found in the freight terminal market (e.g. in the form of for instance segmentation by groups of goods or geographic regions). However, freight terminals must be positioned so that they can provide, or form part of, the desired level of service at the least total marketing channel costs. It is important to note here that the least-cost solution is unique for each organisation, because of differences in customer service standards, inventory costs, physical transport costs, and other logistic costs. There is no need to have the lowest transport cost or terminal cost, but central attention should be paid to lowest total marketing channel cost. This total

combined transport marketing channel approach, and the position of freight terminals in this approach, is explained in the next section.

4. Logistics

United Processors Company

This company harvests and processes a variety of fruits and vegetables in southern and western farming regions of the US. For certain products there tends to be a strong demand in the East and Midwest just ahead of the local growing season. United must harvest earlier than the northern climate allows, supply builds before demand peaks. Normally inventories build in the growing area before road shipment takes place. By switching to rail transport and to the longer delivery times, the company could ship immediately after harvesting and have the products arrive in the marketplace just as strong demand develops. The railroad service also serves the warehouse function and enables at the same time a reduction in logistic costs (transport and warehousing).

4.1 Logistics

Logistics is defined as managing the flow and storage of raw materials, work-in process, finished goods and the associated information from the point of origin to the point of final consumption in accordance with customer needs. Logistics is the management of the **total** marketing channel from customer need to customer satisfaction and can be divided into two separate functions; collection logistics and distribution logistics. Materials management (collection logistics) includes inbound transportation and inventory management for producing companies. The emphasis in this process is on raw materials, finished or semi-finished goods, and company internal services. Distribution logistics encompasses the outgoing product flows from firms to customers through a network of transportation links, storage, distribution and handling nodes. It will be clear that both types of logistics ask for a dedicated approach.

In general, logistics offers great potential for profit improvement. With an integrated approach towards logistics, the visible costs such as transportation, warehousing, handling, and inventory management may be reduced. Moreover, logistic costs consist of hidden costs, such as lost profit opportunities due to failure to ship on time, cost of lost sales, cancelled orders, and customer dissatisfaction associated with stock-outs. For example, failures in transport services may thus lead to stock-outs which may result in lost sales and customer dissatisfaction. Therefore, an integrated approach towards logistics -including combined freight transport- deserves much more attention. For example, the importance of physical distribution of goods **from** point of origin to consumers shows from the amount of \$600 billion a year or 11% of GNP in the United States. At the same time, business logistics costs ten times as much as advertising and is equal to the costs of medical care (Stem et al., 1996).

Thus, it is no surprise that physical distribution and logistics have become more important. Among others, the effects are seen in the following general developments:

1. managers have realised that improving the efficiency of individual logistics operations is useless if the **efficiency** of the individual function throws the total system out of balance
2. the logistics system has become an important competitive tool
3. many of the technological developments over the past 20 years have been **system-**oriented, which force to consider the logistics system as a whole
4. logistics is no longer a part of business where costs are minimised, but is instead seen as an important strategic activity.

If the customer is taken as a starting point for logistic services, it is first important to identify desired customer service elements and their current levels. Secondly, the importance of the different elements in the total logistic solution have to be found. Past research has shown the following correlation between logistic service elements and the resulting customer satisfaction (see Table 4.1).

Table 4.1. Customer service elements of logistics

<i>Customer service elements</i>	<i>Correlation Coefficient*</i>
average delivery time	0,76
delivery time availability	0,72
order status information	0,67
rush service	0,59
order methods	0,56
action on complaints	0,56
accuracy in filling orders	0,46
returns policy	0,44
billing procedure	0,39

* Correlation between service element and customer satisfaction.

Source: Perreault and Russ, (1976, p.8.)

Logistic costs (e.g. transport, handling, inventory) rise disproportionately as customer service levels are increased. This suggests that very seldom the lowest total cost or the highest service performance will constitute the best logistic solution. Furthermore, it should be noted that improving individual logistic components is useless if the total logistic performance worsens. Thus logistics is not considered as part of business where costs should be minimised, but instead it is more and more seen as a strategic performance area where the role of combined transport is increasingly important. Moreover, logistics is an important competitive tool and is the area where competition for distribution control takes place. The fact is also that logistic costs often have a non-proportional relationship (Bowersox et al., 1986). A firm that supports a service standard of overnight delivery of 95% consistency may, for example, have the double logistic costs of one of second morning delivery at 90 percent consistency. If a transport service lacks consistency, inventory safety stocks will have to be higher to provide safety against the possible lack of transport service, hereby thus causing higher inventory costs. A high performance in availability, capability and quality only comes at high costs.

4.2 Combined transport

In the logistic solutions a special position is claimed by combined transport. Combined transport is transport of freight using two or more transport modes, where at least the main transport link is served by rail, barge or coastal transport. Especially for combined transport solutions the logistical quality depends on the strength of the weakest link or terminal. The average perception of combined transport is low; usually this is caused by the perception of non-users. Users of combined transport however, are more satisfied. A stronger position of combined transport will have to come from a strengthening of its own solutions and not from a weaker position of unimodal road transport.

Carriers and terminal operators occupy unique positions in combined transport marketing channels, because they have the advantage of being neutral towards the initial customer needs. This implies that logistic companies may take a broader perspective on marketing channel problems. Especially terminal operators are in a position to create a unique selling position which their customers cannot ignore. The terminal operator may focus on developing more co-operative marketing channel relationships instead of the currently used conflict model. In general, combined transport channels comprise more actors, -which suggest a longer and more complicated channel while profits need to be shared with more actors. However, integration of combined transport operations may deliver economies

o f

1. scale
2. combined operations
3. information (reduction in uncertainty)

4. stable relationships
5. technology
6. supply and/or demand stability
7. costs (reduced transaction costs).

Combined transport is **characterised** by the use of at least two transport modes in an integrated manner in a door-to-door marketing channel (logistical solution). This type of transport may be the ideal mode for carrying freight in order to reduce total channel costs, pollution, road congestion and noise levels. For the carriers the first most important task is to provide the best possible customer-oriented combined transport service for a well balanced price/quality ratio. The primary combined transport objective is to assist in revenue generation for the producing or shipping company, by providing the strategically desired customer service at the lowest total marketing channel cost. This implies that the desired customer service level decides what the lowest marketing channel cost level is.

4.3 Cogistics; logistics focusing on combined transport

The combination of logistics and the use of combined transport leads to our new theoretical framework: **cogistics**. Cogistics is the management of marketing channel flows from the point of origin (production) to the point of final consumption in accordance with customers requirements and focused on using combined transport to the maximum extent possible. This channel integration shifts the point of **cogistic** management from cost reduction to a return on investment focus in combination with total channel performance.

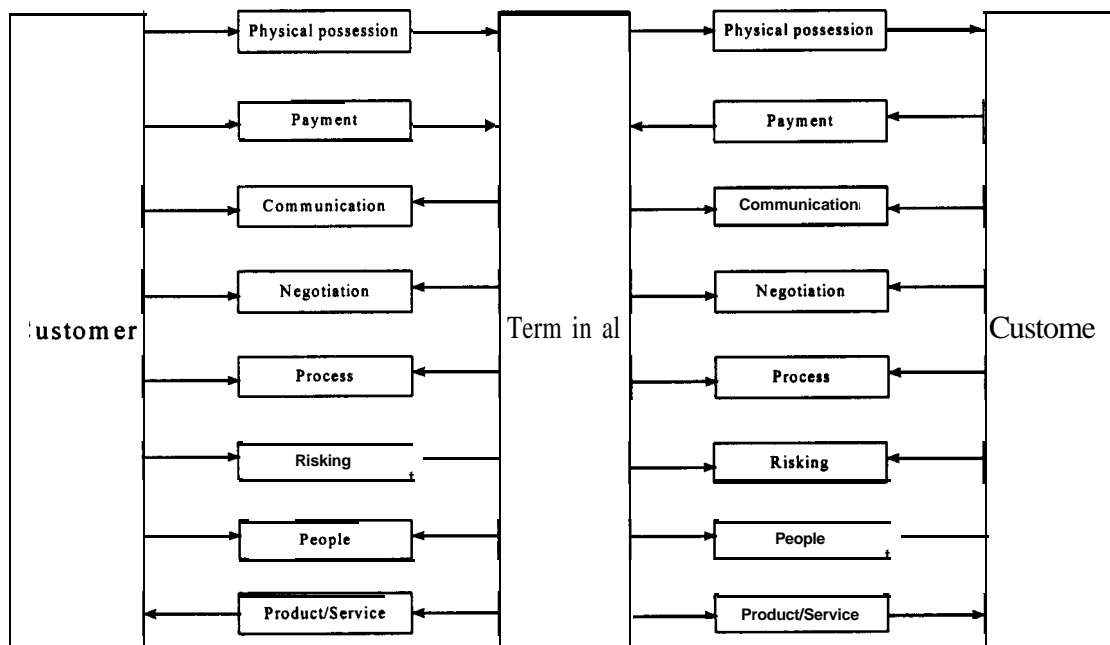


Figure 4.1. Marketing channel with carrier, terminal operator and carrier; in- and outgoing flows.

In Figure 4.1. we see the most important marketing channel flows in combined transport channels. If we link the above figure to the marketing mix, we observe the following: i) payment is more or less equal to price, ii) people represent their company and are extremely important in service processes, iii) process is the perception that carrier and terminal are part of a chain of value added activities, iv) product or service is the transshipment of freight, v) place is found in the physical possession of the freight, vi) promotion is found in the communication and negotiation flows between carrier and

terminal. A special relation between place and product is seen in the transport marketing channel. Product and place are “a given”; this often means that the decision to use an intermodal **freight** terminal is a sort of go/no go decision. Hence this decision process is difficult to influence, suggesting that process, promotion and people are the most valuable elements out of the marketing mix to compete with. These reflections lead to a logistic oriented approach towards marketing channels which, among others, can be **characterised** by:

- wherever justifiable transport is done by barge, coastal shipping or train
- actors strive for a joint reduction in channel inventories
- actors strive for channel wide cost efficiencies
- actors have a long time horizon
- actors share information required for planning and monitoring processes
- actors have multiple contacts on inter firm and channel level
- actors have compatible corporate philosophies at least for key relationships
- actors have a small supplier base to increase co-ordination
- actors in a channel have a leader for a co-ordination focus
- actors share risks and rewards over the long-term
- actors are “distribution centre oriented”; flows are interconnected throughout the channel

Cogistics is about the management of complete marketing channels. Each actor will have different degrees of participation in different elements of marketing flows. This is required from each of the marketing channel actors in order to adequately serve customer needs. Improving the service level of the logistic system performance may increase costs of varying flow elements. On the contrary, a decrease in cost may result from a lower level of customer service performance (lower logistic performance). Channel flows reflect the corresponding customer demand patterns. In general three types of customer demand patterns can be found: i) **regular** and highly predictable; ii) irregular but mathematically consistent; iii) irregular and unpredictable. In recent years the requirement to service many different markets through multiple channels have been increasing. To reach these smaller segments more adequately, smaller volumes may result and less opportunity to aggregate freight volume for cost reductions will be realised.

4.4 The role of information

In **cogistics** a central position is given to the information flows. Success in a **cogistical** approach mainly depends on an excellent information flow performance. Information flow performance comprises the right information and communication systems that ensure the right time and place. For example, at the ECT-terminal in Rotterdam the introduction of an advanced computer system may save **€ 13,4** up to **€ 17,9** per container (handling) compared with current costs (NRC, Rotterdam, 3 October 1998). This example clearly shows that introducing information systems into marketing channel management may serve as a base for improvement of quality, reliability, efficiency, and profits. In this example costs per container will show a decrease of 13.3% up to **17,1%** compared with cost levels of **€ 104,8** per container in 1997. In general information is assumed to be critical to the efficiency and effectiveness of any marketing channel (Burmeister, 1998). Thus, communication and sharing of information is a prerequisite for realising marketing channel success. The use of information technology enables cost reductions and revenue enhancement, and the technology may be provided by different channel actors.

Either the required information can be delivered on customer request; or even better is a 24 hours information service that enables the customers to obtain information by themselves via, for example, Internet. Effective use of ICT may produce lower total marketing channel costs while maintaining or even increasing the level of (service) output. Without higher end-user satisfaction, channel performance would suffer if channel managers

sought cost minimisation for their own sake. Overall the introduction of ICT does have the following advantages:

1. Information technology can shorten waiting/delivery time. ICT can, for example, shorten waiting time for truck drivers at freight terminals, because they know exactly when and where their shipments arrive. It can also speed up delivery times, because the carriers know exactly which shipment is where; there is no longer extra time needed for checking shipments.
2. Spatial convenience can follow from ICT. Because the terminal owner knows exactly when which shipment is coming and going, it is possible to use less storage space.
3. ICT may encourage the user of a terminal to make that terminal a sole supplier of transshipment services. Information systems may introduce exit barriers for terminal customers as well.

5. Conclusion

In this paper we have introduced our new approach towards combined transport, logistics, and marketing channels named: **cogistics**. The central question of this paper was: *Which opportunities do intermodal freight terminals offer for an efficient functioning of the combined transport marketing channels?*

An efficient functioning of combined transport channels will result from a total channel approach by all actors involved in marketing channel transactions. Furthermore, terminal operators will occupy a central position in combined transport channels and offer better balanced price/quality combinations for terminal services they offer. More *shared profits* for all channel members are then to be realised. Especially the efficient use of information technology will enable the realisation of a quality increase (e.g. reliability) and a cost decrease of combined transport. In the combined transport marketing channels a central position is claimed by the intermodal freight terminals. Opportunities that these freight terminals offer are:

- focusing on solutions that are customer driven
- facilitating extensive communication between marketing channel members
- co-ordinating efficient marketing channel organisation
- choosing the right marketing channel partners
- introduction of marketing channel commitment, trust, and co-ordination
- equally sharing of benefits.

A marketing channel is comprised of interdependent actors engaged in the task of fulfilling customer demand in order to realise customer satisfaction. In general, combining marketing channel activities leads to lower costs and improvement and increase of marketing channel output. Channel functions and flows should be allocated to the actor that is best suited to perform them, rather than to the actor that benefits most directly from them. Sharing benefits will make the advantages of combining channel activities available for all channel actors.

All channel activities and flows should be customer driven; customer need and customer satisfaction ascertain channel flows and activities. The application of the marketing channel theory to the combined transport market resulted in typical marketing channels for the combined transport market. It shows which flows are running between carriers and terminal operators. Furthermore, it makes clear that the current central flow is physical possession (moving freight). However physical possession is just one out of a set of channel flow functions. In the near future we foresee a more central position claimed by the communication flow and the related process flow. Terminal operators and carriers will improve their services in order to serve customer need more properly. A better process will

be accompanied by a well balanced product/service combination and by more communication between marketing channel members. This will lead to more co-operative negotiation processes facilitated by customer oriented employees. Actors are then more willing to pay for physical possession of freight and lower risking may lead to higher shared returns by channel members.

As we have seen before, co-operation between channel members is one of the main prerequisites for marketing channel success, In this respect a special place may be occupied by terminal operators. Terminal operators do have a central position in combined transport channels. Moreover, these operators are more or less neutral actors in marketing channels; both carriers and intermediaries do not compete directly with terminals. Financial performance of terminal operators does not signal the realisation of huge profits in the freight terminal market. Thus the generally held belief that terminal charges are high, is not entirely true. Terminal services with an unbalanced price/quality ratio is a more proper expression. An option for terminal operators to improve their marketing channel position is to increase their marketing channel power. Some useful power-increasing instruments for terminal operators may be:

- introducing innovation and new technologies which cause cost reductions and quality improvement
- increasing general transportation expertise
- offering more sophisticated planning and scheduling programs
- introducing more effective rating and routing systems
- obtaining control over transportation information
- collecting data and doing research
- co-ordinating marketing channel conflicts.

Cogistics is the management of marketing channel flows from the point of origin (production) to the point of final consumption in accordance with customer requirements and focused on using combined transport as much as possible. An increase in the importance of channel flows like process, people, and communication may enable a more efficient functioning of total combined transport marketing channels. Information and information technology will play a crucial role in improving combined transport marketing channels.

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Appendix 1: Number and percentage of terminals for combined transport in EU countries.

Land	road/rail		road/inland		road/sea		road/rail/inland		road/rail/sea		road/inland		road/rail/inland		total	
	road	rail	road	waterways	road	sea	road	waterways	road	sea	road	waterways	road	waterways	road	waterways
Belgium	9	23%	1	3%	2	6%	1	3%	6	15%	2	3%	18	46%	39	100%
Denmark	14	38%	0	0%	13	35%	0	0%	10	27%	0	0%	0	0%	37	100%
Germany	99	60%	6	4%	11	7%	17	10%	19	11%	3	2%	11	7%	166	100%
Finland	1	6%	0	0%	2	12%	0	0%	14	82%	0	0%	0	0%	17	100%
France	46	49%	2	2%	18	19%	2	2%	26	28%	0	0%	0	0%	94	100%
Greece	0	0%	0	0%	7	78%	0	0%	2	22%	0	0%	0	0%	9	100%
Great Britain	29	26%	0	0%	42	38%	0	0%	39	35%	0	0%	0	0%	110	100%
Ireland	0	0%	0	0%	10	67%	0	0%	5	33%	0	0%	0	0%	15	100%
Italy	73	59%	0	0%	20	16%	0	0%	31	25%	0	0%	0	0%	124	100%
Luxembourg	1	100%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	1	100%
Netherlands	9	18%	6	12%	10	20%	1	2%	12	24%	3	6%	9	18%	50	100%
Austria	27	90%	0	0%	0	0%	3	10%	0	0%	0	0%	0	0%	30	100%
Portugal	7	33%	0	0%	11	52%	0	0%	3	14%	0	0%	0	0%	21	100%
Spain	22	30%	0	0%	34	46%	0	0%	18	24%	0	0%	0	0%	74	100%
Sweden	16	31%	0	0%	12	23%	0	0%	24	46%	0	0%	0	0%	52	100%
EU	353	42%	15	2%	192	23%	24	3%	209	25%	8	1%	38	4%	839	100%

Source: Ministerie van Verkeer en Waterstaat, 1997

Appendix 2: Financial performance of the terminal sector in the Netherlands.

Table 2.1. Loading, unloading, and transshipment (SBI 63 11) and storage (SBI 63 12) activities in the Netherlands (1995 and 1996)

	<i>Total</i>		<i>SBI 6311</i>		<i>SBI 6312</i>	
	1995	1996	1995	1996	1995	1996
companies	710	780	260	300	450	480
employees	19,560	20,190	10,990	11,190	8,570	9,000
sales (mln €)	2,053	1,995	1,102	1,083	947	912
% of Sales						
costs	90.3%	91.8%	93.8%	93.9%	86.2%	89.2%
• personnel costs	42.9%	43.1%	50.7%	49.6%	33.9%	35.5%
result	9.7%	8.2%	6.2%	6.1%	13.8%	10.8%
result before tax	7.7%	5.1%	5.2%	5.1%	10.7%	5.1%

Source: <http://statline.cbs.nl>, September 1998

We can observe from Table 3.1 that in 1996, 300 companies operated in the loading, unloading and transshipment sector in the Netherlands. These companies employed 11,190 people, while total sales for these 300 companies reached approximately € 1.083 million. The average company had a financial result of 6,1% of sales.

Table 2.2. Loading, unloading, and transshipment (SBI 63 11) and storage (SBI 63 12) activities in the Netherlands (1996) according to employee size.

	<i>Compu nies</i>	<i>Employ ees</i>	<i>Sales mln €</i>	<i>Cost mln €</i>	<i>Result %</i>	<i>Result before tax</i>
SBI 6311	300	11,190	1,083	1,017	6.1%	5.1%
• 0-10 employees	180	820	54	44	18.0%	15.0%
• 10-100 employees	110	4,480	350	315	9.7%	9.0%
• 100 and more employees	20	5,890	680	657	3.3%	2.4%
SBI 6312	480	9,000	912	814	10.8%	5.1%
• 0-10 employees	350	1,270	117	90	23.0%	15.6%
• 10-100 employees	110	3,720	350	315	10.0%	6.7%
• 100 and more employees	20	4,010	445	408	8.2%	1.0%

Source: <http://statline.cbs.nl>, September 1998

For the loading, unloading and transshipment sector we can conclude that most companies operate in the smallest segment (0- 10 employees). The best economic performance is realised by the smallest companies.

Table 2.3. Loading, unloading, and transshipment (SBI 63 11) activities in the Netherlands (1996); income statement.

	<i>Total</i>	<i>0-10 employees</i>	<i>10-100 employees</i>	<i>100 and more employees</i>
sales (mln €)	1,083	54	350	680
• bulk (mln €)	330	27	84	218
• containers/flats (mln €)	359	5	68	285
• other (mln €)	63	2	18	43
• unknown (mln €)	331	20	180	134
costs (mln €)	1,017	44	315	657
• personnel	52.8%	42.0%	56.4%	51.8%
• depreciation	9.4%	17.3%	5.9%	9.1%
• housing, handling equipment	25.5%	18.5%	18.7%	29.3%
• external transport	2.5%	5.2%	4.8%	1.3%
• other costs	9.8%	17.1%	11.3%	8.5%

Source: <http://statline.cbs.nl>, September 1998

Sales are, among other things, composed of bulk, containers and flats, and other. The unknown sales are not given on the consulted website. We can observe that the smallest companies are mainly dependent on bulk sales, the medium-sized businesses are less dependent on one particular segment, while for companies with 100 or more employees container sales are increasingly important.