An Industry Analysis of Express Freight from a European Railway Perspective

Sofia Ohnell*
Johan Woxenius**

*) Department of Logistics and Transportation, Chalmers University of Technology, SE-412 96, Gothenburg, Sweden
E-mail: sofia.ohnell@mot.chalmers.se, Ph: +46-31-772 1338; Fax: +46-31-772 1337

**) Department of Logistics and Transportation, Chalmers University of Technology, SE-412 96, Gothenburg, Sweden
E-mail: johwox@mot.chalmers.se, Ph: +46-31-772 1339; Fax: +46-31-772 1337

ABSTRACT

There is a large difference in both speed and costs between the traffic modes road and air. Rail has not yet been very good at offering services “faster than road but cheaper than air” although there are technical and economical opportunities. With a well developed express intermodal transport system, rail could compete for intra-continental shipments and cooperate with air for intercontinental ones, i.e., replace road and air between airports.

The main purpose of the article is to categorise segments of the express freight market defined by scope of service, transport quality and price and analyse them from the perspective of the rail traffic mode. Services between Sweden and Continental Europe are the main focus, although some domestic Swedish services are included. Secondary objectives are to adapt system modelling tools to the application of express intermodal transport and to line out prospective roles for rail in express transport in general and in some particular cases.

The performed analysis shows that a transport chain containing many actors does not necessarily entail long transport times, and transport over long distances does not necessarily take longer time than short-distance ditto. The analysis also show that many express transport systems are built in a modular way, implying that one subsystem can be exchanged for another, e.g. a railway system.

Key Words: (1) European railways, (2) Express freight transport (3) Industry analysis (4) Intermodal transport, (5) Proxy customer.
1. INTRODUCTION

In the past two decades, goods transportation has doubled in volume in the European Union. Road transport has captured virtually all of the growth and has thus increased its market shares dramatically. From a modest starting point, also air transport has increased significantly. This has not been matched by investments in road infrastructure and airports, which has caused considerable congestion. Transport by road and air also involves comparatively high costs and energy consumption as well as extensive emission and noise problems. Current prognoses show that a “business as usual” approach will imply steeply rising volumes on the roads, e.g. 50% increase of road transport between 1998 and 2010 (European Communities, 2001), and despite current unrest in the industry, in the air. Boeing predicts a 6-10% annual growth in intra-Europe express air networks between 2001 and 2021, while the more traditional air cargo intra-Europe is expected to stay at a more moderate growth rate of 3-5% during the same period.

Hence, fast rail-based intermodal transport is regarded as a means to diminish the problems and the needs for infrastructure investments. High expectations of intermodal transport growth, in particular from the political actors, have not been fulfilled although the industry has shown substantial growth over a number of years. There are many factors that contribute to the fact that the development was not the expected one. Examples are unsuitable production technologies, unrealised scale economies, slow technological development, inferior industrial organization and insufficient marketing. In addition, the competing long distance transport by trucks has increased its competitiveness through, among other things, larger vehicles and more efficient and customer-oriented operations.

Also changes in the demand have implied advantages for road and air transport. There is a particular large and increasing need for fast goods transport. Products that often need fast transport are high-valued products such as electronics, medicines and medical equipment, products with news value such as newspapers and perishables such as flowers, vegetables and fish. Furthermore, with lower stock-keeping levels and lean logistics systems comes a demand for express deliveries as a planned backup when things go wrong. One example of this demand is when something is missing for maintaining operations, e.g., spare parts for a process industry or input material for an assembly line. It is thus not the value of the shipped product itself that is high, but the alternative cost of not having it.

Demand for express freight transport is presently satisfied either through fast single mode road transport, or, for somewhat longer distances, through intermodal air-road transport. There is, however, a large difference in both speed and costs between the traffic modes road and air. The rail traffic mode has not yet been very good at offering services “faster than road but cheaper than air” although there are clear technical, logistical and economical opportunities. With a well developed express intermodal transport system, rail could co-operate with air for intercontinental shipments, i.e., replace trucking between airports, e.g. SAS Cargo’s Air-Rail-project (Ohnell, 2003), and compete for intra-continental ones.

Defining an express transport system in explicit terms is rather difficult. Therefore, most definitions tend to focus on the term “express” relative to “normal” transport services. This means that express transport on a national scale is collected on the evening of day 0 and delivered on the morning of day 1, in international transport 24 hours (Club

EUROTRANS, 1992) or over-night transport is expected between the large industrial areas in Europe and the USA.

The main purpose of the article is to categorise segments of the European express freight market defined by scope of service, transport quality and price and analyse them from the perspective of the rail traffic mode. Secondary objectives are to adapt system modelling tools to the application of express intermodal transport and to line out prospective roles for rail in express transport in general and in some particular cases.

The research object is regular, timetable-controlled, domestic and international express services offered on the Swedish market. Neither freight charter services nor taxi-deliveries and courier services are included. The approach is from a production system perspective, rather than from the end-customer perspective. The reason for this is that the demand side is made up of a large number of small customers, who chose from offered services rather than negotiate the design of the network or its operational characteristics.

The selection of case companies is based on their roles as major actors in the Swedish and European express transport industry and neither on their existing nor potential engagement in rail transport. Although the studied companies provide several different express transport services, this article puts a special emphasis on services those companies categorize as parcel services.

The article is based upon the systems approach as presented by, for instance, Churchman (1979). In previous own work (Woxenius, 1994 and 1998), this approach and the actor approach – as presented by the Uppsala school of thought (see e.g. Gadde and Håkansson, 1992) – has been used for chiselling out a three element approach for analysing the structure of the European intermodal transport industry. The elements actors, activities and resources have been found useful as starting points for industry analyses with different purposes. The application here focuses the structure of the intermodal transport industry, accordingly starting out from the actor categories. In most of the express transport systems studied in this article, the main part of the transport is either by lorry or by air, very few are by train. Therefore, the model by Woxenius (1998) is extended with the activities Road Haulage and Air Haulage, see chapter 3.

The research is part of a five-year project on intermodal transport financed by the Swedish Agency for Innovation Systems and the Swedish Rail and Road Administrations with the overall aim to suggest how railway can be part of express intermodal transport systems.

2. RAIL AS PART OF EXPRESS TRANSPORT CHAINS

The prospective role of the rail traffic mode as part of express transport chains is analysed in this section. A postulate is that it is regarded as unlikely that any of the current rail operators will establish express systems with door-to-door transport\(^2\). The gap between the current core of rail freight – heavy system trains – and the fine-meshed distribution networks needed for parcel services is simply too large. The intermodal businesses target a

---

\(^2\) Nevertheless, Belgian State Railways (SNCB) has started, ABX Logistics with a division for parcels. It is, however, not based on the rail business and ABX is a sister company rather than subsidiary (X-rail News, 2002) and is now a source of financial problems (European Commission, 2003).
market with smaller consignments, but then the railways are often confined to a subcon-tracting role for terminal-to-terminal transport of full unit loads. Forwarders control the customer contacts and consolidate small consignments into full loads.

The very present economies of scale in express transport postulate that someone has to mediate the demand of multiple customers into one or several “productified” transport services with well defined service levels. These express operators that consolidate consignments into full loads for long distance transport is presently dominated by postal operators, forwarders, airlines and so called integrators (e.g., TNT, UPS, FedEx and "old" DHL). For air and road transport these actors usually operate some or all transport equipment, but is not regarded likely that they will start own rail services.

With lack of vertical integration from either side, a market between the suppliers of rail transport and the express freight system is defined. Since the express operators mediate the demand from end customers towards the rail operators, they are here denoted proxy customers. In markets there is a demand and a supply side and each can remain unchanged or change to adapt to the other side of the market. In the long run and if the attitude is open, both sides can change towards a future better state.

Accordingly, the model presented in the Figure 2.1 below divides possibilities for improvements depending on if the characteristics of rail and express freight transport chain are fixed or open for adjustments. The combinations are denoted direct substitution of links, supply adaptation, demand adaptation and visionary solutions. The scale is of course continuous and the simplification with four quadrants is merely for classifying solutions in a pedagogic way. The unchanged production profile of rail is here defined as conventional wagonload and intermodal transport based upon containers, swap bodies and semi-trailers. In no alternative, road is believed to be replaced for accessing consignors and consignees.

![Figure 2.1 Analysis of prospective use of the rail traffic mode in express transport chains.](image-url)

The purpose of this section is not to be normative, the research is still in a relatively early stage, but rather to suggest a theoretical framework and lines of development. In the text, some examples of current applications of rail in express transport chains are given.

### 2.1. Direct substitution of links

In the quadrant direct substitution of links, current rail technology and operational characteristics are matched against the long distance links of current express transport chains.
The pattern of nodes and links is thus fixed and it is head-to-head competition with road and air. For natural reasons, replacing air involves a particular potential for a cost advantage as well as superior environmental image. Major obstacles are the different loading capacity of rail and that current operations are adapted to characteristics of road and air. Operational focus is on modularity, transit time and precision (Ohnell, 2003).

Two levels of substitution can be discerned, either using regular intermodal services or applying the production characteristics of rail in dedicated solutions. The regular services are believed to replace trucking, while dedicated services might need to replace air to justify the high cost when only a fraction of the loading capacity of trains is used. For intra-continental transport, rail can substitute the long haul, while it can act as feeder transport for inter-continental movements.

As shown in chapter 3, express services are often divided into when parcels are delivered, while handing in or pick-up is roughly the same. With a common time for dispatch, air might still have to be used for the fastest services while rail can provide long-haul for the second and third distribution rounds. The speed of road often only works for the last round.

In the USA, UPS is the single biggest customer of intermodal rail services, but there they rather act in the general cargo than express market segment. A European example is that SAS Cargo tried CargoNet/Rail Combi’s regular intermodal road/rail transport between Copenhagen and Oslo and Stockholm respectively during two weeks in the autumn of 2001 (Branke, 2001, 2002). Rail then replaced trucking and the results where so positive that CargoNet/Rail Combi might well be part of the regular service (Ohnell, 2003).

### 2.2. Supply adaptation

In the quadrant supply adaptation, demand is fixed so success relies on the innovativeness of rail operators, infrastructure providers and technology suppliers. Besides speed, the adaptation primarily concerns economically efficient carrying capacity. If air can be replaced, costs and prices are likely to decrease and, hence, the demand ought to increase creating a positive spiral for rail with its competitive advantage on large volumes. A technical attempt to run trains with a small carrying capacity is the CargoSprinter reminding of a lorry that has been tested by DB Cargo with air freight between Northern Germany and Frankfurt Airport3. A similar technology, Trucktrain, is tested in the UK4. Replacing road promises less in terms of cost advantage, but still improvements can be achieved on a system level.

With firm logistics control, freight versions of high-speed trains can offer very fast and high-quality transport that is likely to match the performance of air transport within large parts of Europe. In France, special TGV trains are used for transport of mail and a freight version is discussed. In markets where the demand density is lower, it is more likely with co-ordination with passenger transport either as mixed trains or as dual-purpose trains that can be reconfigured between freight and passenger services like so called quick-change aeroplanes. In Germany, a freight version or at least a compartment of the Transrapid, a Magnetic Levitation Train planned to connect Berlin and Hamburg at speeds of 400 km/h, was studied before the project was terminated due to discouraging costs and environmental

---

3 [www.windhoff.de](http://www.windhoff.de), 2003-03-09.
concerns. The MAGLEV technology, however, is proven by the recently inaugurated service between Shanghai and its airport at a speed of 430 km/h⁵.

The high speed – 200 km/h and more – generally requires that light load carriers are being used and that the wagons are covered. For direct co-ordination with air freight, light-metal containers can be transferred over rollers on platforms and train floors. Besides short transport time, high speed and quick terminal handling mean that costly trains can do more cycles per day and be co-ordinated with fast passenger trains on the tracks.

In Sweden, 90 specially developed 2-axle wagons are used since 2001 for transporting economy mail and some first class mail between main sorting terminals. Trains run at up to 160 km/h and the experiences of the dedicated service replacing trucking are very good⁶. As for most express freight services, the willingness of the infrastructure provider Banverket to provide the needed track slots and a high traffic priority was vital to the progress.

2.3. Demand adaptation

If the demand side can adjust to the current operational characteristics of rail services, another set of opportunities arise. If the qualitative customer requirements are fixed, adaptation regards new pattern of nodes and links in the network, design of load units and express terminal operation principles, the scheduling of different activities and different mixes of the modes on different geographical relations. One example is that rail, compared to air transport, has the advantage of being able to stop along the route. Hence, the current hub-and-spoke systems defined by the character of air transport can be exchanged for several hubs or possibilities for connecting several terminals with one train. Such a traffic design might also be needed for utilising the larger transport capacity of trains.

If not only the production system but also the end customers are willing to compromise their demand, focus can be laid on efficient scheduling of production resources by, for instance, higher transport frequencies and transport over the day. This might facilitate a revival of classic express freight by trains in dedicated compartments of passenger trains.

The potential for direct substitution of links currently covered by lorries, by conventional intermodal transport might be limited, but it can be significantly increased with some adaptation of the scheduling of pick-up routes and terminal operations.

2.4. Visionary solutions

In a longer perspective, some of the fundamental characteristics of the rail mode can act as opportunities for improvements of express services. This change mainly regards the potential speed, large carrying capacity and relatively low level of business economic and social costs offered by rail. Rail’s character of operating along corridors will certainly set its mark on both the offered customer service and the network operation principles.

The market for express freight increases but more importantly, there is an ongoing merger between the parcel and the general cargo market segments. If produced together, rail’s superior carrying capacity can be utilised to increase the speed of service for general cargo

---

⁵ www.maglev.de, 2003-03-09. In German.
⁶ Interview 2003-02-24 with Björn Olsson, Project leader Mail Train, Posten Sverige AB.
without having to employ air at high costs. Also the current parcel segment can benefit from higher frequencies, but above all by lower costs.

Establishing such a service might be beyond the capabilities of the current rail and express actors. For a firmly controlled system there is a certain need for collaboration over company limits or a need for keeping the operations of the full system within one company. If so, however, there will be a very difficult implementation period when flows are built up and a new service/price pattern emerges. The infrastructure provider plays a truly vital role here since such a system needs both good access to rail slots and a high priority to handle disturbances in the network.

3. THE SWEDISH EXPRESS TRANSPORT INDUSTRY

The express transport industry, as it is today, is described regarding the services, the production systems, and the division of roles between the different parties based upon the methodology developed by Woxenius (1998). The second part of this chapter comprises an analysis of the industry.

One company from each of the following four categories is included in the description and in the analysis: (1) National Post Offices: Posten Sverige AB; (2) Forwarding agents: Schenker AB; (3) Airlines: SAS Cargo AB; (4) Integrators: TNT Sverige AB. These companies were chosen partly because they are well-represented on the Swedish parcel market, partly because they represent different kinds of production systems with different degrees of vertical integration.

A study of the number of shipments in the fourth quarter of 2000, having a maximum weight 31.5 kg each, showed that roughly 500 million consignments were sent in Europe. In first and second place were Deutsche Post World Net and La Poste/Poste Italiana with market shares of 19% and 16% respectively. TPG/TNT had a market share of 11% with almost 52 million transported parcels, and Stinnes\(^7\) transported about 8 million parcels, which gave them a market share of 1.6%. Worth mentioning is that 25% of the market belong to “other companies”, which implies that many companies are active in this market segment but each having very small volumes compared to the market’s total size (Transport iDag/iTRAFIK, 2001).

3.1. The case companies and their express transport services

The conditions under which the described services apply are somewhat generalized in the following text and are valid, unless otherwise stated, on working days and between larger cities and/or industrial areas in Sweden and Europe. Basically all services included have a booking deadline of one hour before latest pick-up time, which usually is around 6 pm or in the case of SAS Priority, 1-2 hours before takeoff. The shipments must either be in the form of a parcel between 20 and 60 kg with dimensions ranging between 0.7\*1.15\*1.5 m and 3.57 m\(^3\), or the shipment can be placed on a EUR-pallet with dimension 1.2\*0.8 m and 1.7 m high. Palletised goods are allowed weights up to 1000 kg. Often, but not always several packages and/or pallets are allowed in one consignment. Most services target the busi-

\(^7\) Deutsche Bahn bought Stinnes, of which Schenker is part, in 2002.
ness-to-business market, some business-to-consumer while a few are also open for private customers. Dangerous goods and live animals are not included in this study.

3.1.1. Posten Sverige AB

In 1994, Posten Sverige AB became a joint-stock company with the Swedish State as the sole owner. Since Sweden has deregulated its mail market, Posten is subject to competition on its home market. In 2000 and including mail, about 5.7 billion consignments were handled. All services except for DPD have a delivery time guarantee. When using door-to-door services it is often possible to hand in the package at service centres as well.

Express 07.00 is a fast, domestic transport service. The sender hands in the parcel at one of Posten’s service centres and the receiver picks up the parcel at another one. The shipment can be picked up by 07.00 the next day. This service is produced using the mail flow.

Företagspaket 09.00, 12.00 and 16.00 (company parcel) are three separate services for transport within Sweden. The price includes door-to-door transport with delivery the next day (two days to northern Sweden) before 09.00, 12.00 and 16.00 respectively. The parcels are shipped using Posten’s parcel flow. The price is set according to weight intervals regardless of destination.

Hempaket (home parcel) offers overnight transport in large parts of Sweden from companies to individuals. This is a door-to-door service with delivery 17.00-21.00 the next day (two days to some parts of the country). The price is set per package and weight regardless of destination.

The Postpaket (post parcel) service comprises pick up at the sender’s and transport to a service centre close to the receiver, where both sender and receiver are located within Sweden. The delivery time is one or two days depending on notification method (electronic or traditional). This service is produced using Posten’s parcel flow. The price is calculated per package and weight regardless of destination.

Företagspaket Utrikes (company parcel abroad) is a service for consignments from Sweden to the rest of the world. The service is door-to-door with delivery in most of Europe 1-6 days after pick-up. This service uses Posten’s parcel flow for transport to a gateway from where it is produced in an international flow by a subcontractor. The price is set according to weight. An additional service is sending a unit load, Företagspaket Utrikes Enhetslast (company parcel abroad unit load).

Postpaket Utrikes (post parcel abroad) can be sent to most parts of the world. Included in the service are picking up at the consignor’s and delivery to a service centre close to the consignee.

The DPD-service covers all directions within Europe. Pick-up at the sender’s is always included. The delivery times vary between 1-2 days to Denmark and 5-7 days to Greece. The goods are transported within Posten’s parcel flow to one of three gateways in Sweden and from there DPD takes over the transport. The price is per package and destination country.

---

SkyPak is an international service for transportation in all directions within Europe and other parts of the world. The service comprises door-to-door transport. In producing this service, TNT Express’ production system is used. The shipment is delivered during business hours the next day. The price is set according to weight intervals and destination country. Additional services include delivery before 9.00 or 12.00 the next day.

3.1.2. TNT Sverige AB

TNT is a global provider of express, mail and logistics services. All of the former brands TNT Express Worldwide, TNT Ltd., Mailfast, Interpost, Caxton, PPIC and TNT Logistics are now included in TPG N.V., a public listed company, headquartered in Amsterdam. TPG also includes Royal PTT Post, which is the principal mail provider in the Netherlands. In 2001, TNT Express delivered 3.6 million parcels, documents and pieces of freight a week. The parcel services offered by TNT are always door-to-door with time-guaranteed delivery within regular business hours, and they cover all directions between the destinations where TNT are represented.

TNT Global Express is delivered during the next day, with delivery before 9 am or noon, in which case TNT’s air network is used as the production system, as additional services.

TNT Economy Express, based on TNT’s road network, is delivered day 2 or later, according to the transport buyer’s wishes. Additional services are delivery before 9 am or 12 am.

SkyPak is a brand name wholly-owned by TNT, and can be used for transport to all countries, which TNT delivers to. It is a door-to-door service produced using TNT’s production system. Additional services include delivery next day before 9 am or before noon.

3.1.3. SAS Cargo Sweden AB

SAS Cargo Group is, since 2001, an independent company within Scandinavian Airlines System (SAS). The company consists of three separate shareholder companies, one in Denmark, one in Norway, and one in Sweden. Also included in SAS Cargo Group are SAS Spedition, Cargo Handling, and SAS Airmail. The express logistics company Jetpak Nordic AB is a wholly owned subsidiary of the SAS Group.

SAS Priority is a service for transport in all directions on destinations covered by SAS Cargo and its partners. The service is airport-to-airport and is produced together with SAS Cargo’s other services. The delivery is time-guaranteed according to the arrival time given upon booking. Same-day deliveries are possible and then the consignee can pick up the package 1-2 hours after arrival. It is possible to add a “door-to-door”-service.

Jetpak Nordic AB, another company within the SAS Group, also offers parcel services. Jetpak Today and Jetpak Night, which cover all directions within the Nordic countries and from the Nordic countries to other EU-countries. The only difference is that Jetpak Today is delivered, within regular business hours, the same day as dispatch and Jetpack Night is delivered the next day. Both services are door-to-door with a delivery time guarantee, but

---

9 www.tnt.com, 2002-02-06; www.skypak.com, 2002-02-06; interview with Per Lindelöw; product brochure for SkyPak sold by Posten Sverige AB.

it is also possible to hand in and/or pick up the goods directly at the airport. The production system is separate from SAS Priority’s apart from the air transport. Jetpak Today is also sold by DHL, under a different name, but is produced by Jetpak in the same way as its own Today-service.

3.1.4. Schenker AB

Schenker AB is part of Schenker AG, which in turn is part of Stinnes AG, which was bought in 2002 by Deutsche Bahn. In 2001, Schenker AB had roughly 42 000 contractual customers and handles more than 18 million consignments per year. Schenker’s services follow the time guarantee regulated in NSAB 2000.

Parcel covers both domestic and international shipments. The service is door-to-door but if a pick-up includes less than 10 shipments a collection fee is charged. Distribution to the consignee is according to a time-table and transport usually takes 1-6 days for transport within Sweden or from Sweden to continental Europe. The transport is produced by hauliers and terminals dedicated to or owned by Schenker and Stinnes. The price is set according to destination zone.

HomeDelivery is a service aimed at companies that sell products to individuals in Sweden. The shipment is collected at the sender’s and delivered to the receiver according to a time table, with delivery times ranging from one day, depending on the day the shipment is sent and destination. In agreement with the receiver, Schenker specifies a time interval during which to deliver the parcel. The packages are produced by Schenker’s regular production system. The price is calculated as a function of the weight, the volume and the transported distance.

Schenker also offers services through Schenker Privpak AB, which is a wholly owned subsidiary. Schenker Privpak’s customers are mailing-order and e-commerce companies in Sweden. The goods is picked up at the sender’s and delivered to individuals through a network of goods delivery points. Most of the goods sent by Privpak are ready for pick up two days after collection. The goods is collected by Schenker AB and transported to Privpak’s terminal in Borås, where it is sorted and transported to the delivery points by Schenker AB.

3.2. Description of the Industry

The model used in this part is slightly modified from the one developed by Woxenius (1998), that was briefly discussed in the introduction. Figure 3.1 shows the complete model according to which the services are grouped and structured. The main focus of this part is on the activities included in the different companies’ production systems. These activities constitute the structure according to which the actors involved are identified. Therefore neither actors nor resources are included in the figure.

---

Characterization of the chosen companies is made through the descriptions of the types of services offered, the production of the services, and the division of roles between the different parties. The production systems are identified through the services, which tie the production systems to the other parts.

### 3.2.1. Activities - Description of the Provided Services

An express transport service includes a number of activities. To start with, the service concept is *developed* by an actor. This activity includes decisions on what to include in the service (e.g. door-to-door or terminal-to-terminal), dimensions of the goods accepted, and often, depending on the time dimension of the transport, what production system to use. Next activity is *selling* the service to a buyer, who might or might not also be the user of the service. Selling the service to the transport buyer can be performed either by the same actor as develops the service concept, or by another actor who then acts as something resembling a retailer for that service. At the receiving end of the activity chain, the different levels of sellers have a responsibility towards the two different kinds of buyers to fulfil the transport part of the service, according to the contracts. Hence, the commercial system sometimes involves several layers of proxy customers. The activities in the physical production system consist of moving the goods through the production system.
3.2.2. Resources - Production of the Services

In picking up the goods at the sender’s, messenger cars or small lorries are used. At the sorting terminals, which are major resources themselves, the packages are either carried by the personnel employed there, rolled in cages or moved by fork-lifts (goods loaded on pallets). The long-distance transport leg uses either lorries, semi-trailers or the belly of passenger air crafts. At the receiving end, the same equipment is used as at the beginning of the transport chain.

3.2.3. Actors - Division of Roles between the Different Parties

The actors performing the different activities included in each of the services studied are shown in Table 3.1 also showing the different levels of integration between companies.

Posten\textsuperscript{12} uses their own transport companies for all transport services and has its own terminals for sorting in Sweden. Often P.EX or Poståkeriet is used for local pick-up/distribution and the domestic parcel flow is produced using Poståkeriet or contracted hauliers. In some cases the goods is flown from remote parts of Sweden to, for instance, Arlanda. Such a transport is often bought from Jetpak, Falcon Air or SAS Priority. For services including transport to continental Europe, the actors involved differ depending on the service, e.g. DPD is produced by the DPD-network whereas Företagspaket Utrikes is produced by Pan-Nordic Logistics and SkyPak is produced by TNT’s network.

Schenker\textsuperscript{13} uses either their own or dedicated transport operators for all activities included in the production of the studied services. In the case of Privpak, all transport is carried out by Schenker and only the terminal at the dispatching end is owned and run by Privpak.

SAS Cargo\textsuperscript{14} buys all local transport for its Priority-service from local messenger car companies, such as Box and Adena, but all handling, terminal, and air transport activities are performed by SAS Cargo’s own resources or by other members of the WOW Alliance. Within Europe, the goods are almost exclusively transported by passenger planes. Like SAS Cargo, Jetpak Nordic uses subcontractors for all local transport but has its own network of agents for the handling activity within the Nordic countries. For overnight services to the rest of the world (Jetpak Night), DHL’s network is used for the handling and distribution activities and for same-day deliveries different local actors at the destinations are used. The air transport is bought either from SAS passenger operations or from any other airline, such as Maersk, Finnair, Lufhansa, or Skyways, with available capacity.

TNT\textsuperscript{15} uses either their own fleet of messenger cars or appointed local couriers for pick-up and deliveries, and have an integrated transport chain where the long-distance air transport leg, terminals and handling are operated by its own resources.

\textsuperscript{12} Interviews with Anders Ingelmo and Per Lindelöw; e-mails from Katrin Berg, Maria Glansk, Anders Ingelmo, Kjell Pettersson, Inger Österholm.
\textsuperscript{13} Interviews with Fredrik Goldbeck-Löwe and Jonas Wåkeus.
\textsuperscript{14} Interviews with Lars Clarving and Mats Ludvigsson.
\textsuperscript{15} Interviews with Per Lindelöw.
Table 3.1. A description of the services based on activities and actors. **Legend:** P (Posten), Sk (SkyPak), T (TNT), S (SAS), J (Jetpak), Sc (Schenker), Pr (Privpak), Se (sender), Re (receiver), O (Other actor, * = activity not present within this service)

<table>
<thead>
<tr>
<th>Activity</th>
<th>Service</th>
<th>Express 07.00</th>
<th>Företagspakket 09.00</th>
<th>Företagspakket 12.00</th>
<th>Företagspakket 16.00</th>
<th>Hempaket</th>
<th>Postpakket</th>
<th>Företagspakket Utrikes</th>
<th>Postpakket Utrikes</th>
<th>DPD</th>
<th>SkyPak (Posten)</th>
<th>SkyPak</th>
<th>TNT Global Express</th>
<th>TNT Economy Express</th>
<th>SAS Priority</th>
<th>Jetpak Today</th>
<th>Jetpak Night</th>
<th>Parcel</th>
<th>HomeDelivery</th>
<th>Parcel (International)</th>
<th>Privpak</th>
</tr>
</thead>
<tbody>
<tr>
<td>Developing the service</td>
<td></td>
<td>P</td>
<td>P</td>
<td>P</td>
<td>P</td>
<td>P</td>
<td>P</td>
<td>O</td>
<td>Sk</td>
<td></td>
<td>Sk</td>
<td>T</td>
<td>T</td>
<td>S</td>
<td>J</td>
<td>J</td>
<td>J</td>
<td>Sc</td>
<td>Sc</td>
<td>Sc</td>
<td>Pr</td>
</tr>
<tr>
<td>Selling the service</td>
<td></td>
<td>P</td>
<td>P</td>
<td>P</td>
<td>P</td>
<td>P</td>
<td>P</td>
<td>P</td>
<td>P</td>
<td></td>
<td>Sk</td>
<td>T</td>
<td>T</td>
<td>O</td>
<td>J</td>
<td>J</td>
<td>J</td>
<td>Se</td>
<td>Sc</td>
<td>Sc</td>
<td>Sc</td>
</tr>
<tr>
<td>Handing in (at a goods centre)</td>
<td></td>
<td>Se</td>
<td>Se</td>
<td>Se</td>
<td>Se</td>
<td>Se</td>
<td>Se</td>
<td>Se</td>
<td>*</td>
<td></td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>Se</td>
<td>Se</td>
<td>Se</td>
<td>Se</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Picking up (at the consignor’s)</td>
<td></td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>T</td>
<td>T</td>
<td>T</td>
<td>T</td>
<td>*</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>Sc</td>
<td>Se</td>
<td>Se</td>
<td>Sc</td>
</tr>
<tr>
<td>Loading/transportation</td>
<td></td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>T</td>
<td>T</td>
<td>T</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>O</td>
<td>Se</td>
<td>Se</td>
<td>Sc</td>
<td>Se</td>
<td>O</td>
<td>Sc</td>
</tr>
<tr>
<td>Road transportation</td>
<td></td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>T</td>
<td>T</td>
<td>T</td>
<td>T</td>
<td>T</td>
<td>S</td>
<td>O</td>
<td>S/O</td>
<td>S/O</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Air transportation</td>
<td></td>
<td>O</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>S/J</td>
<td>T</td>
<td>T</td>
<td>T</td>
<td>T</td>
<td>S</td>
<td>O</td>
<td>S/O</td>
<td>S/O</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Handling</td>
<td></td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>J/O</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Unloading/transportation</td>
<td></td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>T</td>
<td>T</td>
<td>T</td>
<td>T</td>
<td>T</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>Sc</td>
<td>Sc</td>
<td>O</td>
<td>O</td>
<td>Sc</td>
</tr>
<tr>
<td>Picking up (at a goods centre)</td>
<td></td>
<td>Re</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>Re</td>
<td>Re</td>
<td>Re</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>Rep</td>
</tr>
<tr>
<td>Delivering (to the consignee)</td>
<td></td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>T/O</td>
<td>T/O</td>
<td>T/O</td>
<td>T/O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>Sc</td>
<td>Sc</td>
<td>O</td>
<td>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fulfillment to the buyer</td>
<td></td>
<td>P</td>
<td>P</td>
<td>P</td>
<td>P</td>
<td>P</td>
<td>P</td>
<td>P</td>
<td>Sk</td>
<td>T</td>
<td>T</td>
<td>O</td>
<td>J</td>
<td>J</td>
<td>J</td>
<td>Se</td>
<td>Se</td>
<td>Sc</td>
<td>Sc</td>
<td>Sc</td>
<td>Pr</td>
</tr>
<tr>
<td>Fulfillment to the seller</td>
<td></td>
<td>P</td>
<td>P</td>
<td>P</td>
<td>P</td>
<td>P</td>
<td>P</td>
<td>O</td>
<td>Sk</td>
<td>T</td>
<td>T</td>
<td>S</td>
<td>J</td>
<td>J</td>
<td>J</td>
<td>Sc</td>
<td>Sc</td>
<td>Sc</td>
<td>Sc</td>
<td>Pr</td>
<td></td>
</tr>
</tbody>
</table>
3.3. Analysis of the Industry

Many of the studied services are very similar regarding the door-to-door, delivery time, time between booking and pick-up, and package dimension aspects. However, from a railway perspective, four parameters seem to be of special interest, the degree of vertical integration, the production time, the geographical coverage, and the weight of the packages. The latter one is important since different physical handling systems are required depending on whether the maximal weight is 35 kg (manual handling) or 1000 kg (palletised goods handled with fork lifts).

Perhaps somewhat surprisingly, a high degree of vertical integration does not necessarily lead to the shortest production time for a service, and vice versa, a low degree of vertical integration does not always lead to a long production time, see Figure 3.2. Actually, the services with the fastest delivery, JetPak Today and SAS Priority, are the ones that have the lowest degree of vertical integration of the services studied. The actor who has the responsibility to the buyer of the service, then acts as a transport chain driver, who controls the transport chain but uses agents or subcontractors for all or nearly all of its activities. This would imply that in spite of an increased number of interfaces between different actors, a short production time can be achieved.

![Diagram showing mapping of services according to degree of integration, production time, and geographical area.](image)

Figure 3.2. Mapping of services according to degree of integration, production time, and geographical area.
However, there is no immediately apparent connection between the degree of vertical integration of a service and the geographic area covered. This graph might indicate that the shape of Sweden and the transported volumes in this study, do not justify a highly vertically integrated system, unless it is possible to co-produce these services with others, which have larger transport volumes.

In the performed study, the production time, i.e. the time that passes from the goods enters the production system until it leaves the same, is fairly independent of the geographical area a service covers. Same-day or next day deliveries are possible from Sweden to several destinations in continental Europe.

4. CONCLUSIONS

All of the services are more or less modular, implying that in most cases one subsystem can be exchanged for another, which opens up the possibility of using railway operators as subcontractors in these systems. As mentioned above, the transport time is not by necessity connected to neither the number of actors involved in the transport chain, nor to the degree of vertical integration. This suggests that a if a transport chain including railway is organised and managed in a suitable way, the fact that such a system requires at least two transport modes and most likely several different actors as well, should not hamper this system’s performance regarding transport time and delivery time reliability. Another opening for railways as subcontractors in express transportation systems is that several service concepts are developed by one actor but sold and/or produced by another.

The attractiveness of rail is, for obvious reasons, especially high when air can be substituted. The certain elements of cross-subsidising through flat-rate prising means that the express operators hardly cover their costs for the airborne part of the production system and that they are very keen on finding rail solutions.

REFERENCES

Interview persons and web pages are referred to in the footnotes.


X-rail News (2002) \textit{Belgian ABX will be a holding outside SNCB}, w. 10, 2002.