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# Information Flows Supporting Hinterland Transport by Rail: Applications in Sweden

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## Idea of the study

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- Interest in how information flows are being managed and how they are used to support the physical operations
- Hypotheses
  - Rail shuttles and dryport operations are much simpler organised and controlled than generally expected
  - Particularly when contrasted to container port terminals, liner shipping, forwarding and conventional rail
  - The larger actors in the shipping, forwarding and seaport segments pressure the intermodal and dryport operators to invest in ICT systems they do not think they need
  - If simple ways of handle the information flows appear in the study – it might be because it is sufficient
- Interviews with Swedish actors
  - Four terminals, three intermodal operators, one each of shipper, seaport and software supplier

## Information system support

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- Maturity of business processes and their IT support in four levels (Heinrich and Simchi-Levi, 2005)
  1. Disconnected processes
  2. Internal integration
  3. Intra-company integration and limited external integration
  4. Multi-enterprise integration
- Systems used (Stair et al, 2008)
  1. Proprietary in-house developed legacy systems
  2. Off-the-self systems provided by major ERP system suppliers
  3. Single user simple office applications (e.g., Microsoft Excel )

## The SCM framework

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- *The network structure*: includes the actors in the supply chain and their links. These actors can include shipping lines, terminal operators, transport operators, forwarders, shippers, etc.
- *The key business processes*: include the activities that produce value to the customer; typically this include transportation, terminal operation such as lifting on and off units, short time storage, consolidation of units, etc.
- *The management components*: includes the managerial variables by which the business processes are integrated and managed across the supply chain. The components used in this study includes a variety of technical subcomponents including IS and IT.

Source: Lambert and Cooper, 2000

## A conceptual model for managing the information flow supporting hinterland transport

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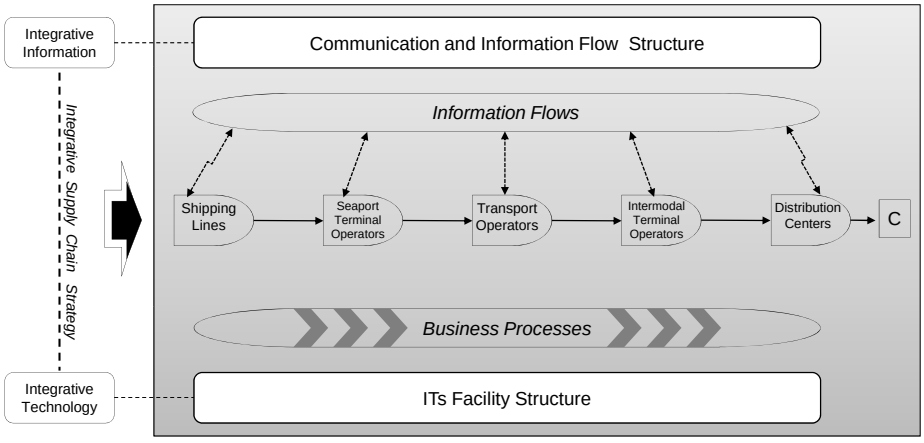


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The Port of Gothenburg rail shuttle system as of May 2010.
Numbers - dedicated port shuttles
Squares - other destinations with daily rail services via the general intermodal network.

Source: Port of Gothenburg, 2010.

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## Intercontainer Scandinavia's rail shuttles from January 2011

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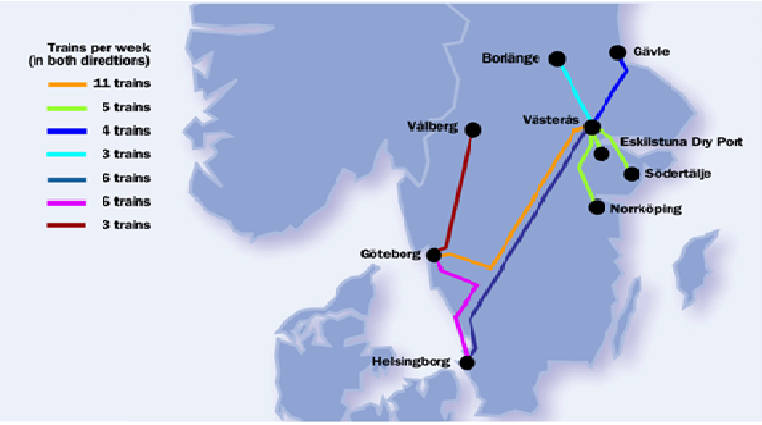


Source: TrainDrivers, 2010

## CargoNet's rail shuttles as of September 2010

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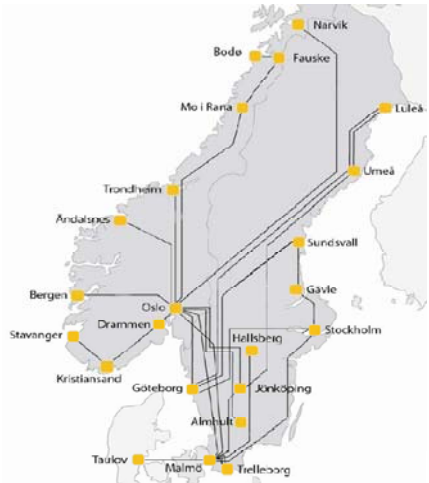


Source: CargoNet, 2010

## The actor network structure and key business processes

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| Actor category | Key business processes | Typical customers (C) and suppliers (S) | Examples of organisations | Appr No. of actors in Sweden |
|---|---|---|---|---|
| Shipper: | Order and pay for the transport service. | S: forwarder, shipping line, intermodal operator, road haulier | Manufacturers (Volvo, SKF, StoraEnso...), retailers (IKEA, H&M...) | >1000 |
| Forwarder: | Design, market and coordinate the door-to-door transport chain. | C: shippers; S: shipping line, seaport | Kuehne+Nagel, DHL, DB Schenker... | >100 |
| Shipping line: | Move containers between ports. | C: shippers, forwarder; S: seaport, intermodal operator, road haulier | ACL, CMA CGM, Eimskip, Maersk, MSC, K Line, Team Lines, Unifeeder... + RoRo/RoPax shipping lines... | >25 |
| Seaport: | Tranship between ship and rail. | C: shipping line, forwarder, intermodal operator | With rail shuttles: ports of Gothenburg, Gävle, Helsingborg, Mälarhamnar, Norrköping, Södertälje, Trelleborg | 20 handling containers (LoLo and RoRo) |
| Intermodal operator: | Design, market and coordinate the rail transport service including terminal handling. | C: shipper, forwarder; S: rail haulier, inland terminal operator | CargoNet, ERS Railways, Green Cargo, Intercontainer (Scandinavia), MidCargo, SCT Transport, VanDieren, Vänerexpressen | 10 |
| Rail haulier: | Move trains between terminals. | C: intermodal operator | Hector Rail, MidCargo, RushRail, TGOJ Trafik... | 5 |
| Inland terminal operator: | Tranship between rail and road. | C: intermodal operator | CargoNet, Gävle Containerterminal, ISS Trafficare, Logent, Vänerexpressen, large manufacturers and retailers... | >25 |
| Inland terminal principal: | Own terminals. Manage the tender process. | C: inland terminal operator (on tender) | Jernhusen (Swedish state), Municipalities, Vänerhamn... | >25 |
| Road haulier: | Move containers between the inland terminal and the consignor/consignee. | C: shipper, forwarder | | >500 |

## Typical information flow guiding the flow of an import container (part 1)

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| Physical location | Transmission trigger | Activity | Key data content | Transmission media | Actors involved |
|---|---|---|---|---|---|
| *Container arriving by ship* | | | | | |
| 1. Ship | Estimated arrival time at port known | Consignee informed of arrival time at port | Estimated arrival time, container number and type etc. | EDI | Shipping line to consignee |
| 2. Ship | Consignee informed about arrival time at port | Consignee contacts forwarder and orders an intermodal hinterland transport | Destination, container number, type and weight, arrival time in port etc. | Phone, fax, e-mail | Transport customer to forwarder |
| 3. Ship/ Port | Forwarder receives booking | Forwarder contacts intermodal operator and makes a booking on the train | Destination terminal, train departure, container number, type and weight etc. | Excel-sheet by mail, fax | Forwarder to intermodal operator |
| *Container unloaded from ship in port (sometimes before 3)* | | | | | |
| 4a. Port | A few hours before train departure (according to agreement with the port) | Intermodal operator sends a loading list for the train to the port | Destination terminal, train departure, container number, type and weight, sometimes which wagon or group of wagons to load each container on | Excel-sheet by mail, fax, homepage forms | Intermodal operator to port |
| 4b. Port | Same as 4a | Intermodal operator sends a loading list for the train to the rail haulier for calculating train weight etc. | Same list as 4a | Excel-sheet by mail, fax | Intermodal operator to rail haulier |
| 4c. Port | Same as 4a | Intermodal operator sends a loading list for the train to the inland terminal operator to use as unloading list | Same list as 4a | Excel-sheet by mail, fax | Intermodal operator to inland terminal operator |

## Typical information flow guiding the flow of an import container (part 2)

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| Physical location | Transmission trigger | Activity | Key data content | Transmission media | Actors involved |
|---|---|---|---|---|---|
| *Container loaded on train in port and train departs* | | | | | |
| 5. On train | Loading completed | Port send confirmation of loading to intermodal operator, listing any discrepancies from the loading list | Same list as 4a, with any discrepancies added. | Excel-sheet by mail, fax | Port to intermodal operator |
| *Train arrives inland terminal and container unloaded* | | | | | |
| 6. At inland terminal | Unloading completed | Inland terminal sends confirmation to intermodal operator, listing and discrepancies from the unloading list | Same list as 4a, with any discrepancies added. | Excel-sheet by mail, fax | Inland terminal to intermodal operator |
| 7. Port | After confirmation list arrives | If discrepancies, Intermodal operator informs consignee that container is delayed etc | Delay information | Phone, mail | Intermodal operator to consignee |
| 8. At inland terminal | Forwarder arrives to pick up container after scheduled release time | Inland terminal sends confirmation to intermodal operator that container has been picked up | Container number, time etc. | e-mail | Inland terminal to intermodal operator |
| *Container is picked up at inland terminal and delivered by truck to consignee* | | | | | |

## Classification of the Swedish hinterland transport information system

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| IT and integration level | Intermodal system characteristics | IT support | Data trans-mission media | No. of Swedish terminals at this level |
|---|---|---|---|---|
| 1. Disconnected processes | Low cooperation, single terminal actors, single route, small volumes (<100 TEUs/day) | Excel, homemade systems, paper | Phone, Fax, E-mail | Many |
| 2. Internal integration | Larger actors or multi-terminal actors, several routes, larger volumes (100-400 TEUs/day) | Excel, Hogia, InPort etc. | Phone, Fax, E-mail, webpage forms | Medium |
| 3. Intra-company integration and limited external integration | Larger actors or multi-terminal actors, many routes, very large volumes (>400 TEUs/day) | Hogia, InPort, Modality, CATOS etc. | EDI, webpage forms | Few |
| 4. Multi-enterprise integration | Integrated supply chain, very large volumes (>400 TEUs/day) | Hogia, InPort, Modality, CATOS etc. | EDI | None |

Classification according to four types of business process defined by Heinrich and Simchi-Levi, 2005

## Actors driving the information system modernisation

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- Ports
  - Port of Gothenburg introduces a ”ladder” classifying the capacities and functionalities of a dryport including ICT maturity
- Terminal principals
  - Estblishing the rules of the tendered operations
- Shippers
  - For instance, IKEA wants control in order to determine which boxes that go to warehouses, to inland depots or directly to stores
- Forwarders
  - Administrative routines
  - Derived from the forwarders’ customers
- Intermodal operators by the nature of the operations
  - Network operations
  - Mix with semi-trailers

## The effect of new information systems

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- Main advantages of the new information systems
  - Simplify the physical operation at terminals
  - Make communication efficient
  - Tool for extending the service offer
- Respondents’ views
  - Basically happy with the information flow and do not state a lack of information – transfer speeds and errors no big problem today
  - Reducing the administrative work is seen as the major benefit
  - ICT does not restrain them from developing new services and business models
  - Earlier bookings wanted, but not a matter of ICT
  - No wish for a level 4 integration, does not add from level 3
  - In general, they do not identify themselves as a link in a supply chain, but as a provider of a single service

## Conclusions

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- Fairly low IT and IS maturity in the hinterland operations – integration level 1 or 2
- Current investment phase – integration level 3
- Integration level 4 seems neither wanted nor possible
- Changes mainly done to reduce administrative costs, improve work environment and to satisfy customer demands
- Question remains:
  - Perhaps the current simple information systems are the appropriate ones for these operations?