Outbound Intermodal Logistics, from the Manufacturer's Gate to the Final Customer: The Future Logistics Management IT Systems as Perceived by the Supply Chain Partners

Bengt Ramberg
Vice President, Wallenius Wilhelmsen Lines AS

Jan Tore Pedersen
President, LogIT AS and Chairman, LogIT Systems AS

Frank Knoors
Managing Director, Sequoyah International Restructuring

ABSTRACT:
The market for logistics management systems is developing rapidly. But it is still a long way to go. The development and failures we have seen the last decade will most likely continue the next.

From the first adaptations of the ERP style solutions, we have seen new market entrants and new leaders, promoted by the consulting communities. Several of the systems providers have experienced severe problems in delivering promised functionalities agreed in the customer contracts. The new brands are continuously are expected to solve the problems experienced by their predecessors.

The SCM technology market is a consequence of the fact that few industries have focused on, and have the sincere willingness to invest in systems to manage outbound logistics. The income to the technology developers is then limited, and the consequent funds available to system development insufficient to guaranty robust and solid solutions.

The customer of logistics management systems will in the next five to ten years experience the same instability as in the past.

The D2D Technology is based on EU sponsored funds over the last decade, and builds on a magnitude of past development projects. As such, the D2D Technology will provide an alternative to the developments made in the commercial market.

Key Words: Multi-modal transport chain, Transport chain management, System development, System integration.

1 INTRODUCTION

1.1 *The Door-to-Door project*

The European Commission has the long-term objective to reduce road transport to help combat traffic congestion, pollution, and road accidents. Alternatives to road and land transport are rail, inland waterways (barges), and ocean transport. One of the initiatives to solve these problems is the door-to-door (D2D) project, which has a total budget of 7,3 million Euros (*D2D – Demonstration of an integrated management and communication system for door-to-door intermodal freight transport operations)*.

Five existing logistics chains have been chosen to demonstrate that the technology works. The chains cover intermodal logistics processes for cars, farming equipments, metal products and general cargo.

1.2 *Overview and research questions*

This paper covers aspects related to the improvement of outbound supply chains, from the manufacturer's gate to the final customers.

The last decade most industries have strongly focused on improving professionalism in inbound logistics and manufacturing. In several mature industries, the future improvement potentials, with respect to cost and time, are minor. Industries

today are moving strategic focus from inbound to outbound logistics, and the integration with the supply chain partners' business processes.

Some of the outbound logistics players have gradually, positioned themselves as Lead Logistics Providers (LLP), and offering such services, or elements of it, to key customers. The most predominant examples are Third Party Logistics Providers (3PLs) that have invested significantly in LLP competencies through acquisitions and incremental development.
The growth and the new business opportunities in the logistics outsourcing industry has causes many firms from different industries to enter the field. The new entrants might move from shipping, land transport, management consulting or finance.

The experiences gained in the initial stage of the EU D2D project, indicates the offering of LLP services by the present players in the outbound supply chains, to be a major challenge.

To answer the challenges, several questions can be raised:

- What has been the development in Supply Chain Integration, from raw materials, through manufacturing and assembly, distribution and logistics to the final consumer, the last decade?
- What have been the experiences from the application and implementation of ERP Systems (Extended Enterprise Planning Systems), or other independent system solution on outbound logistics?
- What is available of Outbound Logistics Management IT Systems in the open market with the requested functionality, and at which costs?
- What is the cost requirement set by the Outbound Logistics Business itself, the supply chain partners, the potentials LLP's and the final customers?
- Can improvement of costs and Value Added Services through Supply Chain Reengineering of Outbound Logistics justify the investments in systems and related costs?

1.3 *The development in supply chain integration*

Globalization, lead-time reduction, customer orientation and outsourcing are some major changes contributing to the focus and interest into logistics management. Integration of the supply chain has become an important way for the industry to gain competitive advantages (Bowerson, Daugherty, Dröge, Rogers, Wardlaw, 1989, CLM, 1995). As a result, the role of logistics providers is changing both with respect to contents and complexity. New firms from different fields are entering the market competing with the traditional transport and warehousing companies.

In today's global marketplace, individual firms no longer compete as independent entities with unique brand names, but rather as integral parts of supply chain links. As such, the ultimate success of firm will depend on its managerial ability to integrate and coordinate the intricate network of business relationship among supply chain members (Drucker, 1998, Lambert & Cooper, 2000).

A supply chain is referred to as an integrated system, which synchronizes a series of inter-related business processes in order to:

- Acquire raw materials, components and parts
- Transformation of these raw materials, components and parts into finished products
- Add value to these products
- Distribute and promote these products to either retailers or customers
- Facilitate information exchange between the supply chain partners

The main objective of the system integration is to improve the operational efficiency, profitability and competitive position of the firm and its supply chain partners. The ultimate goal is to improve the whole chain. Consequently we are talking about the growth and development of global competition between supply chains, and partnership and alliances between the supply chain partners.

The growth of the supply chain concept has required logistics organizations to improve the flow of information both internally and externally. The increased information requirement have facilitated and integration of logistics and supply chain information systems in many companies. The increased use of electronic commerce and enterprise resource planning (ERP) and other tools and techniques, will shape the business process for foreseeable future. Companies should understand their options and their impact when making decisions to support their supply chain system.

2 SEARCH FOR OUTBOUND LOGISTICS MANAGEMENT SYSTEM

2.1 *Introduction*

Assessing the market for logistics IT systems is a major challenge. The terminology and descriptions of the functionality of the applications have not reached global standardization. The market of system solution to outbound logistics has all characteristics of an infant industry. The marketing language being used seems to position every offer as being able to solve all problems for everyone.

The conflict of interest between the software and consulting companies selling the system technology and the industries and service companies buying the intended solutions, is evident. The sellers will normally try to identify the buyer's financial position and their willingness to invest. The offered solution is then priced accordingly. Often limited coherence between the functionality promised and the related price exists. The implementation success is often low, often leading to court cases between the seller of technology and the buyer of the intended solutions. Nucleus Research has surveyed i2 customers and found that fifty two percent was not satisfied with the intended outcome of implementation (Nucleus Research, Inc, Research note D1, 2003).

2.2 *System overview*

In the search for logistics system, the authors have made the following classification. All markets have a BUY-side and a SELL-side:

- The BUY-side is the customer buying a product from a supply chain, containing the systems visible to the buyer.
- The SELL-side is the part of a supply chain doing the actual selling process, containing systems visible to the seller.

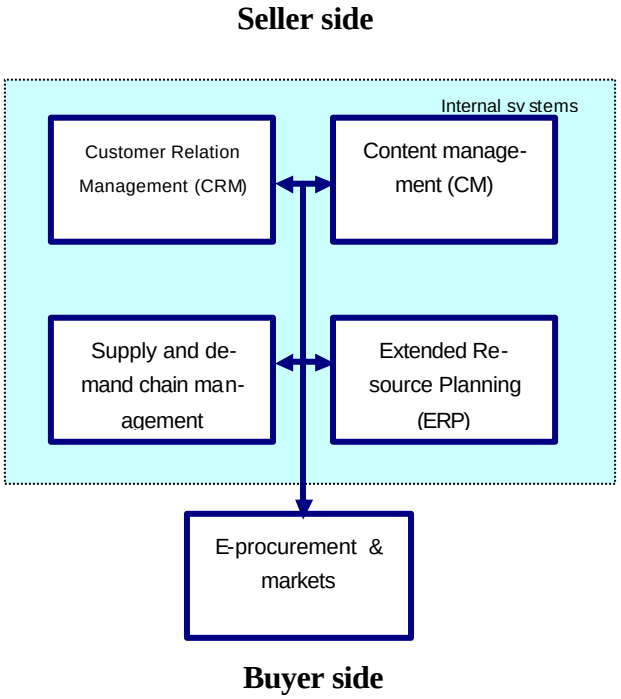

Figure: Applications relevant for logistics management. Source: D2D 2003

The figure above presents a schematic overview of the application areas that are relevant for logistics, either directly or indirectly.

Content management (CM) is in most cases an Internet web site on which the products and services offered are presented. The web site is an electronic catalogue and in many cases more than that. Although a catalogue offers "one-way" communication only, potential customers may also enter orders, request for information, register his opinions, and all other types of information that in the old days was collected by a salesman through personal contact. Content management systems not only provide information but also gather information that can be processed into actions or analyses that are valuable for the business.

Customer relation management (CRM), the increased interaction possibilities with customers, has gained considerable importance. The Internet customer does not have to be anonymous and in most cases values a personal treatment. This is only possible if the business gathers information about these customers in an intelligent manner, processes this information, and makes it available for next contact.

Enterprise resource planning (ERP) systems are aimed primarily at the internal integration of logistics within a single organization. The systems strongly support the efficient execution of various logistics processes, like customer order processing, production control, product sourcing and procurement, and the planning and control of production schedules, inventory management, and transport orders. These systems get less attention today because of the Internet revolution, but are still at the heart of the logistics operation.

E-procurement and e-markets are under very strong development, which goes beyond the procurement functionality in ERP systems. This is not so much a business application (i.e. for a single business), but (esp. with e-markets) a mechanism for organizing joint procurement facilities around databases accessible through the Internet. The focus is on crossing boundaries between individual organizations and the subsequent business processes.

Supply and demand chain management, including APS (Advanced Planning and Scheduling), are packages containing a series of functionalities aimed at planning, order entry, and execution over the borders of individual businesses. It requires additional functionality on top of the ERP systems. Besides traditional ERP suppliers, also new suppliers (like i2 and Manugistics) are active in this field.

2.3 *The Logistic Management hierarchy*

We can distinguish between three levels of systems:

1. Supply Chain Management Systems organize the material flow between subsequent production stages of the same production process including the delivery of the produced product
2. Logistics Management Systems organize the distribution of a single type of good between subsequent production/distribution stages, including transport and warehousing
3. Transport Chain Management Systems organize the movement and handling of these goods between two specific points through the deployment of a (possibly) intermodal transport chain and involving added-value service.

2.4 *Five core capabilities*

For many organizations, five key capabilities are particularly important in terms of building competitive advantage and market differentiation; performance management, shipment planning, documentation and compliance, shipment visibility and event management.

Performance management capabilities allow companies to capture and use logistics information to measure the performance of internal logistics functions, as well as external providers (carriers and 3PLs). Properly designed and implemented, performance management solutions produce accountability and enable continuous improvement among internal providers and 3PLs. The fullest expression of performance management is

realized when that capability extends across trading partner relationships.

Shipment planning, the second critical capability, seeks to lower costs and improve service through activities like load consolidation, mode selection, carrier selection, and routing. An effective shipment-planning capability, supported by the right enabling technology, can help shippers improve their management of the entire shipping process. Through shipment planning, for example, companies can create shipments from actual orders, optimize the transportation order flow, and assign specific routes and delivery information.

Documentation and compliance for international shipping mean having the right product information, and ensuring that the information is in the right place at the right time. This capability involves understanding and creating the appropriate documentation surrounding a shipment as well as complying with the regulations of all countries involved. Key components within documentation and compliance include country quotas, product classification, and letters of credit.

Shipment visibility is often simply referred to as "track and trace," but in reality, it's much more than that. This capability enables the real-time, proactive and reactive, visibility of shipments at the SKU level using multiple query points. That means users can access real-time data about shipments based on any number of variables including SKU number, customer identification and shipment origin.

Event management is the fifth critical capability of the logistics footprint and has recently, along with shipment visibility, experienced tremendous growth and development. Event management entails alerting and reporting actual transportation events against planned events. Deployed correctly, event management solutions can reduce inventories and overall transportation costs. These solutions also can greatly enhance customer service and satisfaction. Customers know exactly what they will be receiving and when. They are also alerted to any potential problems well in advance.

3 THE NEXT GENERATION OF LOGISTICS MANAGEMENT SYSTEM

3.1 *ERP-style solutions (1980 - 1995)*

Many SCM applications evolved from traditional ERP applications, referred to as “ERP style applications”; require that the supply chain solution’s underlying concept is chain oriented from the start. The ERP system will then integrate the services into the overall planning and optimization process. ERP style applications lack a flexible planning structure. However, it should be possible to deal with transport services composed into multi-modal transport chains for which the planning, contracting, administrative duties and monitoring is organized with a single-mode simplicity. ERP style applications also lack integration between capacity planning and network planning.

ERP style applications are from their history back office systems, which means that they are not primarily built for communication through the Internet. However a chain oriented solution requires an easy information exchange between the systems of subsequent nodes in the supply chain.

3.2 *The next generation*

The focus for B2B exchanges in today's capital environment is to achieve liquidity in their exchanges. Next generation exchanges (the first generation exchanges that survive) will be the ones that develop, acquire, or partner to offer the value-added network services that will attract multiple trading partners and intermediaries throughout the supply chain.

One of the first industry segments to embrace the online trading exchange model was transportation and logistics. Logistics is inherently complex because of the multitude of trading partners involved in Supply Chain Management. The concept of a Web-based hub to act as a central information portal for the movement of goods throughout the supply chain gained immediate support from carriers and shippers alike.

First generation logistics exchanges were focused on providing an online facility for matching loads between buyer and seller. While viewed as somewhat limited today, this functionality was the critical first step in establishing the online model as a viable one.

The first generation's limited functionality was the primary reason for slow adoption of online trading exchanges among large multinationals. For mid-market companies, especially those who chose not to adopt EDI because of the expense, finding carriers over the Web were in itself an incentive. What they got, in essence, was a cheap and easy way to tender a load to a carrier for non-time-sensitive freight movements. But for those who had already embraced EDI, including many of the Fortune 500-type multinationals that will drive B2B e-commerce adoption, there was little incentive. In fact, some argue it made sense for them NOT to participate, because doing so meant they where embracing a technology that essentially put their smaller and less capitalized competitors on an equal competitive plane.

By focusing their initial value proposition on connectivity, the first generation transportation exchanges had difficulty building a community. The key for second-generation transportation exchanges will be quickly developing and integrating end to end logistics management functionality into their offering, like total landed costs calculation and automated carrier selection.

3.2.1 *Total landed cost*

A method for calculating the total landed cost (TLC) of goods moving across borders has long eluded logistics departments.

A significant first-mover advantage exists for those logistics exchanges that quickly integrate today's advanced TLC tools. These applications enable buyers to understand the total procurement costs by factoring in freight costs, tariffs and duties, taxes, insurance and other financing charges. With this valuable information, they can make significantly better buying decisions. Another key area of functionality that will help define the winners and losers in the second generation of transportation exchanges is automated carrier selection. Applications that factor TLC calculations, a shipper's existing service contracts and carrier relationships are a key enabling technology for optimal logistics management. Multi-variant carrier selection criteria (like cost, service level, and contract terms) are best applied across carrier communities like those established in an online marketplace.
Making these advanced logistics management tools available in an online exchange environment is the incentive that will drive buyers of transportation to participate.

3.2.2 *Multi-Modal and Global Capabilities*

While many shippers are increasingly mode-neutral, concerning themselves more with the reliability of the service, it's in the best interest of logistics exchanges to develop a multimodal network of service providers.

Perhaps the biggest imperative for multi-modality within next generation logistics exchanges is their integration with multiple vertical exchanges, which tend to have modal preferences. For example, a logistics exchange may act as the fulfilment "punch out" for vertical exchanges in high-tech, consumer packaged goods, and steel, which all have requirements for different modes.

3.2.3 *Logistics Service Contract Management*

The first wave of transportation exchanges was focused on the immediate obvious opportunities to match spot demand with excess capacity in all the modes. The Internet's reach and ease of use gave shippers and carriers an optimal medium for sharing information related to excess capacity and available loads. While valuable, matching spot demand to unused capacity just scratches the surface of logistics management. The vast majority of goods moving around the globe do so under a service contract between buyer and seller of logistics services. In 2002, up to 85% of freight moved by truck is done so under a long-term contract, and more than 90% of ocean shipments are under contract. But the majority of logistics don't yet offer management of logistics exchanges under service contracts (Burn Stearns 2002).

3.2.4 *The Virtual Logistics Department*

The race for functionality among logistics exchanges is furious because the rewards are huge. Shippers have long sought a solution to their entire supply chain event management (SCEM) challenges. It is reasonable to expect that they will now turn to private exchanges, consortium exchanges, and logistics service providers to gain this SCEM functionality.

The 1990s saw in North America the widespread adoption of outsourced logistics relationships with third-party logistics companies (3PLs) and dedicated contract relationships for logistics. The 3PL industry has settled in to an annual growth factor of close to 20%, despite some growing pains related to customer service and performance management. The industry's growth reflects the corporation's focus on core processes and competencies, a clear boom for outsourced suppliers. It's estimated that less than 5% of logistics expenditures worldwide are outsourced, leaving a huge market opportunity for suppliers who can fulfil the outsourcing of logistics management functions.

Next generation logistics exchanges are poised to get a large share of this outsourced logistics pie. Logistics departments are not only looking to outsource the majority of their logistics processes to one provider; they are also seeking a one-stop shop for logistics applications. This highlights once again the importance of building functionality for logistics exchanges in addition to establishing a network of participants.

Shippers want a "virtual logistics department" in their logistics exchanges, a complete suite of supply chain event management applications that allow them to have end-to end visibility throughout the supply chain. This includes integrated products that enable more efficient management of the sourcing-to-distribution, order-to-delivery, and order-to-cash cycles.

4 THE D2D TECHNOLOGY

4.1 *The D2D System*

The systems developed in the D2D project are divided into two functional modules:

- TCMS – Transport Chain Management System, used for managing multimodal door-to-door transport operations.
- FTMS – Freight Transport Monitoring System, used for monitoring the actual transport operations and to provide feedback if the schedules are not adhered to.

4.2 *TCMS Overview*

4.2.1 *The Concept*

The Transport Chain Management System (TCMS) is designed to manage single- or multimodal transport chains. TCMS provides computer support to companies that offer Door-to-Door transport services to its clients, i.e. a ”One-Stop-Shop”.

TCMS handles all types of information related to managing such operations efficiently and handles all type of documents that are necessary to perform the transport and to evaluate the

performance over time. This means that the TCMS database handles any type of document related to the transport that LCL would like to include (claims form is one example).

The main functions of the transport chain management system TCMS are:

- *Organising transport*. This is facilitated by enabling the definition of a transport chain through describing a set of services that must be executed in order for the transport to be performed smoothly. In practice this means handling of contracts, quality indicators, time- tables etc. The services thus defined and linked may or may not be involved in the physical handling of cargo (a customs office is an example of an actor in the transport chain that is important to the success of smooth transport, but that does not handle the cargo, only the documentation related to the transport). When the chain is defined, the services may be booked *automatically* through the exchange of electronic booking and confirmation messages. Booking can be triggered by an ERP-system, by a stock-control system in a warehouse, or by a client application designed for booking.

- *Providing documents*. The different service providers along the Transport Chain need different forms of documents in order to ensure that the transport is performed efficiently and legally. These documents are distributed to the different actors when they are needed. Product documents may also be transmitted to the receiver of the cargo. One example is a certificate documenting the quality of the product.

- *Monitoring and controlling the transport*. It is important that the Transport Chain Manager (TCM) has a complete understanding of the status of the transport and the cargo at all times. It is particularly important that information regarding irregularities in the transport chain compared to the agreed schedule is made available as soon as possible. If the deviation from the schedule is unacceptable, the transport must be reorganised, by using the same functions that was used to organise the transport in the first place. If the deviation is acceptable, information about it must still be communicated to the actors in the remaining part of the chain, and to the receiver.

- *Visualising the status*. As indicated in the previous paragraph, many people may be interested in learning the status of the transport. In order to make the multi-modal transport chain more transparent, this status is made available to the authorised people. Such visualisation may be achieved through exchanging messages or through providing the status available through WEB technology. The TCMS has both capabilities.

The development has been based on a thorough analysis of the requirements for flow of information between all the parties of a multimodal transport chain. The TCMS database uses the TRIM data model to ensure completeness and consistency.

4.3 *The Business Processes*

Another way to present the use of TCMS is to describe activities, or business processes, that a Transport Chain Manager typically is engaged in when using TCMS for transport management. The main business processes are shown in the figure below.

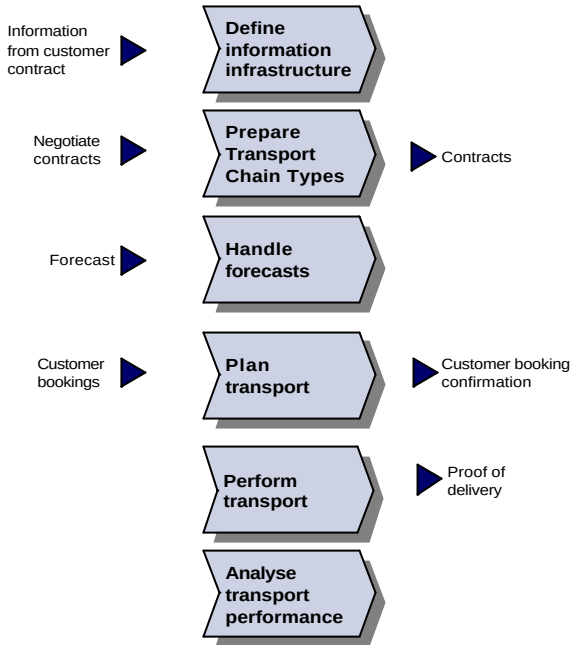

Figure: The main business processes. Source: D2D 2003

In short, these processes are:

1. **Define information infrastructure**; which constitutes defining the background information required for TCMS to operate. Examples are: locations, transport means type, transport means, load unit types, service categories, etc.
2. **Prepare transport chain types**; where all the generic transport chains to be used are defined. A transport chain type is "a transport chain without an associated schedule". By not having an associated schedule, the transport chain type is reusable. A transport chain (which has a schedule associated to it) is not reusable and may appear only once.
3. **Handle forecasts** is part of transport planning. The transport chain manager typically receives forecasts long before the actual transport is to take place. The information is normally related to volume per day or week for a given period.
4. **Plan transport** means reacting to bookings from customers (in some cases also called transport orders), either preliminary bookings or firm bookings and results in fully planned transport operations and confirmation to the customer.
5. **Perform transport** means doing everything needed in order to ensure that the transport reaches its destination as agreed with the customer, or transport user. This includes handling claims from customers regarding the quality of the transport.

6. **Analyse transport performance** comprising performing post-calculations to see whether the transport cost was according to budget and performing an analysis of the performance of transport service providers.

4.4 *The John Deere Demonstrator*

Wallenius Wilhelmsen's demonstrator in the D2D project is John Deere. John Deere is a manufacturer of heavy agricultural machines, and their demonstration chain is the inter-modal transport of tractor units from Mannheim in Germany to dealers in Australia.

The first illustration shows multiple information flows. The challenge in many logistics chains today is the information exchange between many actors using different formats on relevant documents, and different exchange methods such as fax, e-mail, EDI, paper-forms, e.g.

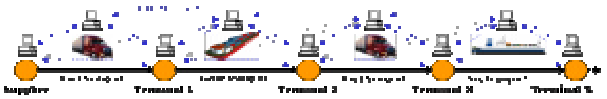

Figure. The Present State (AS-IS) with complex information flow between actors in a logistics chain.

The next figure illustrates a future improved conceptual state (TO-BE) and the essence in the desirable achievements in the D2D project. The concept is based on integrating ICT systems and electronically messages in the transport chain. The illustration shows that information is exchanged over a common information management platform.

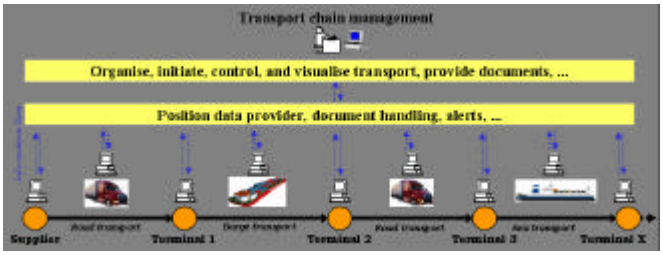

Figure. Transport chain information concept (TO-BE)

Integration of a TCMS can improve the process by handle the information flow from e.g. forecast and planning activities to transport finalization and performance analysis. Such a system will create a single point of contact for information exchange, improve information response time, and secure information and cargo tracking and tracing.

4.4.1 *As-is documentation of John Deere demonstrator*

The main physical transport legs in the John Deere chain are:

1. Truck transport from Plant in Mannheim to the Rhine barge terminal in Mannheim
2. Barge transport from Mannheim to Antwerp
3. Truck transport from Antwerp to Zeebrugge
4. Deep-sea transport from Zeebrügge to Australian port (Fremantle)
5. Truck transport from Australian ports to John Deere tractor dealers

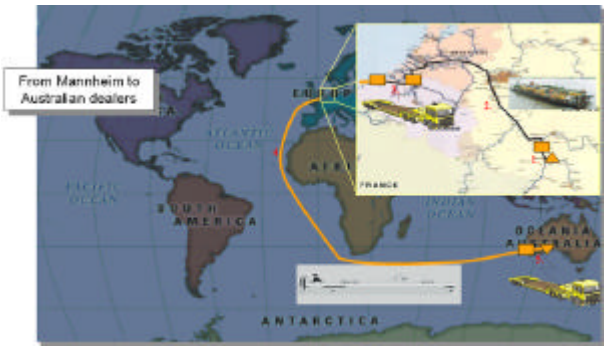

Figure. John Deere transport chain Source: D2D 2003

The figure below illustrates the main processes in the transport chain for tractors from the John Deere plant in Mannheim in Germany to the port of Fremantle in Australia. The process model illustrates the processes identified from a "Customer order" is sent to John Deere and the units are ready for transport, and ends at Australian dealer with "Tractors delivered and accepted by dealer/end-consumer."

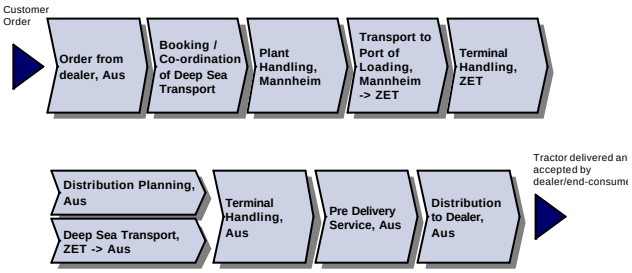

Figure. John Deere supply chain process model

Some processes are described with sub-level processes. All processes are also described at a workflow level. The focus in this model is the interaction between different actors, ICT-systems, and the information-flow in the logistics chain.

5 COST REQUIREMENT TO THE FUTURE TECHNOLOGY

The monetary value from supply chain reengineering of outbound logistics and the subsequent implementation of the LLP functions is generally defined as a ratio of revenue to total costs. A SC can enhance its monetary value through increased sales, market share, and labour productivity, while reducing expenditures, defect, and duplication of real and substitute processes. Since such value directly reflects the cost efficiency and profitability of the SC activities, this is the most widely used objective function of a SC model. Characteristics of the SC model are:

Asset utilization, *which* can be estimated by several different metrics such as net asset turns (a ratio of total gross revenue to working capital), inventory turns (a ratio of annual cost of goods sold to average inventory investment), and cube utilization (a ratio of space occupied to space available).

Return-on-investment (ROI) which is a typical financial measure determining the true value of an investment. Its measure includes the ratio on net profit to capital that was employed to produce that profit, or the ratio of earning in direct proportion to an investment.

Cost behaviour. In the SC framework, cost management requires a broad focus, external to the firm. Thus, cost may be viewed as a function of strategic choice of the firm's competitive position, rather than a function of output volume (Scank & Govindarajan, 1993). A traditional cost classification (fixed versus variable cost), which works at the single firm level, may not make sense for the supply chain network affected by multiple cost drivers (e.g. scope, scale). An alternative cost management principle for a SC framework includes activity-based costing (ABC), target costing, and cost of quality (COQ).

6 CONCLUSION

The market for logistics management systems is developing rapidly. But it is still a long way to go. The development and failures we have seen the last decade will most likely continue the next.

From the first adaptations of the ERP style solutions, we have seen new market entrants and new leaders, promoted by the consulting communities. Manugistics had a leading position in the period 1998 to 1999, i2 from 1998 to 2001, and newcomers like G-Log, Viewlocity and Log-Net have emerged the last three to four years. All of the new leaders are promoted by the consulting industries and the technology journals. Several of the systems providers like Manugistics and i2 have experienced severe problems in delivering promised functionalities agreed in the customer contracts. The new brands are continuously are expected to solve the problems experienced by their predecessors.

The SCM technology market is a consequence of the fact that few industries have focused on, and have the sincere willingness to invest in systems to manage outbound logistics. The income to the technology developers is then limited, and the consequent funds available to system development insufficient to guaranty robust and solid solutions.

The customer of logistics management systems will in the next five to ten years experience the same instability as in the past.

The D2D Technology is based on EU sponsored funds over the last decade, and builds on a magnitude of past development projects. As such, the D2D Technology will provide an alternative to the developments made in the commercial market.

7 REFERENCES

Bear Stearns, B; "Egistics", an Examination of e-business's Impact on the logistics market, June 2000

Bowerson, DJ, Daugherty PJ, Dröge CL, Rogers DL, Wardlaw DL. Leading Edge Logistics-competitive positioning for the 1990s. Oak Brook (IL): CLM, 1989

Council of Logistics Management. The challenge of managing continuous change. Prepared by Global Logistics Research Team at Michigan State, 1995

Cooper, M. C.., Lambert, D. M., & Pagh, J. D. (1987). Supply chain management: Moore than a new name for logistics. The International Journal of Logistics Management, 8(1), 1-13

Drucker, P.F. 1998, Management's new paradigms. Forbes, October, 152-177

Lambert, D.M. 6 Cooper, M.A., 2000, Issues in supply chain management. Industrial Marketing Management, 29, 65-83

Enslow, B;, Vice President, Strategic Initiatives for Descartes Group. "The Virtual Logistics Department: Next Generation Logistics Exchanges", April 2001

Kroneberg; A. & Ramberg B.:
-The Future Role of Shipping in Global Automotive Supply Chains, IMP, 2001
-Development of Global Logistics management Strategy for WWL, NOFOMA, 2001

Lee, H. L. and Whang, S., E-Business and Supply Chain Integration" (November 2001), SGSCMF-W2-2001, Stanford Global Supply Chain Management Forum.

Nucleus Research, Inc, Research note D1, 2003)

Lattman, P., 2000. VMS: Lower cost, more options for growth companies. ID Systems

Monczka, R.M., Morgan, J., 1998. What will happen and what should you know? Purchasing 124, 78-85

Shank, J. F. & Govindarajan, V. (1993). A strategic cost management: The new tool for competitive advantage. New York, NY: The Free Press