Utilizing e-Logistics

Case Studies in Sweden and China

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Abstract

As the incredible growth of the Internet is changing the way corporations conduct business, logistics service providers must consider changing their traditional logistics system into an e-Logistics system. The purpose of this study is to provide a better understanding of how organizations utilize e-Logistics within their supply chain. To reach this purpose, two research questions are stated, focusing on how can the e-Logistics system be described, as well as how the factors that influence the e-Logistics system can be described. To answer these research questions, a qualitative research approach was used where case studies on Volvo Logistics Corporation in Sweden and Haier Logistics Corporation in China were conducted. From the in-depth interviews and used to collect data, the findings show that the e-Logistics system can be described as a process, as an information system and from the value that it creates. The findings further indicate that reliability factors, maintainability factors, software factors and facility, transportation and handling factors, all influence the e-Logistics system. On the other hand, availability factors, economic factors, organizational factors and test and support equipment factors are of low-level importance for e-logistics system. The findings also indicate that there are some regional and political factors that influence the e-Logistics system, most notably an indication of China vs. Sweden (i.e. East vs. West) factors. This, however, deserves further research.
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1 Introduction

This chapter gives background knowledge and some key concepts related to this study. Then the research problem and research questions are presented to provide the overall purpose of this study.

1.1 Background

Supply Chain Management (SCM) that is now seen as a governing element in strategy and as an effective way of creating value for customers has generated a substantial amount of interest among both managers and researchers (Simchi-Levi and Kaminsky 1999).

A supply chain is a network of suppliers, manufacturing plants, warehouses, and distribution channels organized to acquire raw materials, convert these raw materials to finished products, and distribute these products to customers. The efficient design and operation of supply chains is one of the important components of planning activities in a manufacturing firm. The strategic level supply chain planning involves deciding the configuration of the network, i.e., the number, location, capacity, and technology of the facilities. The tactical level planning of supply chain operations involves deciding the aggregate quantities and material flows for purchasing, processing, and distribution of products. The strategic configuration of the supply chain is a key factor influencing efficient tactical operations, and therefore has a long lasting impact on the firm. Furthermore, the fact that the supply chain configuration involves the commitment of substantial capital resources over long periods of time makes the supply chain network design problem an extremely important one. (Tjendera, et al., 2005)

SCM is a network of the logistics systems and related activities of all of the individual companies/organizations that are a part of a particular supply chain. It can be traced to the 1980s and it was not until the 1990s that this term captured the attention of senior level management in organizations. A supply chain has been recognized as an important approach to make organizations more globally competitive and help to increase their market share with consequent improvements in shareholder value. (Coyle, 2003) It benefits from a variety of concepts that were developed in several different disciplines, such as marketing, information systems, economics, system dynamics, logistics, operations management, and operations research. There are many concepts and strategies applied in designing and managing supply chains (Simchi-Levi and Kaminsky 1999). The expanding importance of supply chain integration presents a challenge to research to focus more attention on supply chain modeling (Tayur, et al., 1999). Based on the emerging distinction between SCM and logistics, in October 1998 the Council of Logistics Management announced a modified definition of logistics. The modified definition declares the Council’s position that logistics management is only a part of SCM. (Lambert and Cooper, 2000)

Ayers (2001) shows that there is much cost saving in logistic processes and one of the potential moves is to consider logistics as part of the Supply Chain. The next definition can be easily learned: logistics is that part of the supply chain process that plans,
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Logistics means the integration of two or more activities for the purpose of planning, implementing and controlling the efficient flow of materials and products from the point of origin to the point of consumption. Logistics involves the integration of information, transportation, inventory, warehouse, material handling, and packaging. Depending upon its origins, logistics is often seen as begin synonymous with distribution activities, either the physical distribution of product, SCM, pipeline management, or supply and transport. Whichever description is used, the basic definition of logistics is the same; namely, getting the right goods to the correct place at the time and in the condition required by the customers (Attwood, Peter and Nigel Attwood, 1992). Generally speaking, the most common form of logistics has traditionally been based on moving large shipments of items in bulks to select strategic customers in a few geographic locations. Shipments have also traditionally been tracked by container, pallet, or other unit of bulk measurement, not by individual item or parcel. (Bayles, 2001)

Logistics performance may be conceptually viewed as a subset of the larger notion of firm or organizational performance (Bowersox, et al., 1992). Essentially, logistics performance is composed of three key components: the first, logistics productivity, that is used to create the meaningful productivity standards to measure the ability of track and managing logistics costs; the second, logistics service performance, is concerned with tracking metrics associated with the ability of logistics functions to meet customer service goals; the final component, logistics performance measurement systems, focus on what and how performance is to be tracked (Ross, 2003). Managers today increasingly face the challenge of improving logistical performance within their organizations. When a firm confronts this challenge and undertakes the risk of improvement, its managers must grasp leadership of the change process. The logistics excellence provides managers and others the motivation for and means of becoming thoroughly committed agents of logistical change. Logistics Excellence is about change management, the focus is on how to go about changing an organization’s commitment and culture to support revitalization of its logistics process. (Bowersox, et al., 1992)

The Internet and SCM/Logistics

In the 90s, an open-system of computer network, known as the Internet, made available global communications with a much lower operating cost. World Wide Web (WWW) cyber space has offered companies an opportunity to establish electronic commerce (e-commerce) with customers directly or with other business firms that may later form partnership in the SCM (Bayles, 2001). The incredible growth of the Internet is changing the way corporations conduct business. The advances in the Internet offer a wide range of opportunities for companies to find new ways of contacting their business in order to cope with increased competition more efficiently and effectively. As a result, e-Logistics practices are increasingly becoming the subject of studies evaluating the impact of Internet on economic growth and business performance. (Bayles, 2001)

According to Ross (2003), the distance between suppliers, manufacturers, distributors, customers, and consumers continues to shrink because the e-Commerce is having an enormous impact on the logistics function in most companies. The e-Commerce is
causing organizations to redefine their market assumptions, value propositions, and value delivery systems. It’s also forcing firms to take on new value chain roles and responsibilities.

Coyle (2003) considered the influence of Internet when he derived his classic internal value chain showing primary activities which a business must do to exist and the secondary activities required to control and develop the business and which are common across the primary activities. An organization today must consider the effect of Internet enabled commerce on their distribution channels and the value chain.

The science of logistics has become advanced with globalization. As a result, the role of SCM and linkage between source, intermediaries, producers, buyers and end users has become even more critical. Internet and e-Commerce not only revolutionized the way goods are sold, but how they are delivered. Customers demand customized products delivered at very high speed with complete order flexibility and convenience. Today’s customers want to be able to track their orders instantly from the moment they purchase the goods until the moment the goods arrives on their doorstep, and be able to reroute packages, determine delivery costs and time-in-transit, and break up their orders for multiple ship-to addresses. The shift of power from the seller to the buyer is creating a new era of expectations, and buyers - whether they are consumers or businesses – say they will not tolerate experiences such as partial shipments of goods on an “installment” basis, poor product return policies, or surprise backorders performance. (Bayles, 2001)

The most common use of e-commerce today is to research vendor and product information. This is a primary reason that some vendors have only a Web site on the Internet to merely advertise their products. However, other companies have advanced online procurement system that permit a buyer to electronically check available stock, negotiate price, issue an order, check on the status of the order, issue an invoice, and receive payment. The ultimate e-commerce procurement system is still in the development stage and will evolve over time. (Coyle, 2003)

Today, the application of Internet technology has propelled the SCM concept to a new dimension. Originating as a management method to optimize internal costs and productivities, SCM has evolved, through the application of e-Logistics technologies, into a powerful strategic function capable of engendering radically new customer value propositions through the architecting of external, Internet-enabled collaborative channel partnerships (Ross, 2003). E-supply chain, a term we are using for the natural combining of supply chain and e-commerce, is the tsunami of change that will wash away the old models and transform business activity. It will be pervasive in those businesses that dominate markets and industries in the next decade. It will be at the heart of how to communicate, develop successful products and services desired by the consumers, improve process efficiency, and sustain low inventories with high fill rates and no returns. (Poirier and Bauer, 2001) According to Ross (2003), actualizing e-SCM is a three-step process. Companies begin first with the integration of supply channel functions within the enterprise. An example would be integrating sales and logistics so that the customer, rather than departmental measurements, would receive top attention. The next step would be to integrate across trading partners channel operations functions, such as transportation, channel inventories, and forecasting. Finally, the highest level would be achieved by utilizing the power of the Internet to synchronize the channel functions of the entire supply network into a single, scaleable "virtual" enterprise, capable of optimizing core
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competencies and resources from anywhere at any time in the supply chain to meet market opportunities.

e-SCM is fast becoming a "must have" in the global logistics industry. It goes beyond the application of Internet technologies (the common interpretation today), to the use of electronically-processed information to facilitate the planning and execution of supply chains. This allows companies to monitor, plan and execute their supply chain more effectively. (Lim, 2002)

Market sentiment against dotcoms did not put a stop to technology innovation and the Internet revolution. The concept of e-SCM has already kicked-off in the West. Over the past two decades, logistics cost in the US measured as a percentage of GDP, decreased from 16.1% in 1980 to 9.5% in 2001. This remarkable productivity and performance improvement was attributed largely to the use of IT and integrated SCM practices. (Lim, 2002)

Many Internet and traditionally-based e-commerce companies, whether focused on business-to-business (B2B) or business-to-consumer (B2C) markets, have come to realize that easy access to information and communication and the delivery of their products or services are important drivers in developing market competitiveness (Sarkis, Meade and Talluri, 2004).

Logistics is a subset of SCM, and accordingly, e-Logistics is a subset of e-SCM (Giménez and Lourenço, 2004). e-Logistics is one subset of a larger external logistics market. e-Logistics can be defined as the transfer of goods and services using Internet communication technologies such as electronic data interchange (EDI), e-mail and World Wide Web (WWW). (Gunasekaran, 2003)

Also as a part of e-business, e-Logistics, is applying the concepts of logistics electronically to those aspects of business conducted via the Internet (Bayles, 2001). It is difficult to define e-Logistics comprehensively because the potential impact of e-business on logistics and SCM is not yet fully understood. One possible definition is that e-Logistics simply means processes necessary to transfer the goods sold over the Internet to the customers (Auramo, 2001). Kim and Lee (2002) argue that the definition of e-Logistics is the virtual logistics business activity and architecture among the companies based on the Internet technology. Also the e-Logistics framework which is expansion of conventional logistics framework enables business integration among the separated information system.

1.2 Problem Discussion

e-Logistics has become a "hot" topic for a number of different reasons. These include the trend towards multi-site operations with several independent parts involved in the production and delivery process, new and increasingly cut-throat marketing channels and the electronic marketplace. Traditional supply chains and trading partner relationships are exploding into intricate and dynamic virtual networks of trading partners and service providers. The emphasis in these relationships is to derive significant value through increased revenues and decreased costs. Achieving this in any organization directly depends on the performance of all the others in the network and their willingness and
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ability to coordinate (Swaminathan, Smith and Sadeh, 1998). The question facing
organizations today is not if they should join these new electronic networks, but how.

According to Dawe (1995), if we think of a logistics organization as a house, see Figure
1.1, each activity can be recognized as rooms. There are three elements in the rooms:
Processes, people and systems. The processes are the walls, ceilings, and floors that
define the relationships between activities, the people are the inhabitants that work with
the processes; and the systems are the plumbing and wiring connecting and supporting
the rooms.

![The Logistics House](image)

**Figure 1.1** The Logistics House
**SOURCE:** Adapted from Dawe, 1995, p102

The process determines whether the right things are being done. The system determines
whether those things are being done right. (Dawe, 1995) However, the logistics of e-
commerce is not easy. Making systems integration a high priority are crucial steps in
making it work. (Seideman, 2000) Information has always been central to the efficient
management of logistics but now, enabled by technology, it is providing the driving force
for competitive logistics strategy (Christopher, 1992). Many companies are now
designing supply chains which cannot operate without sophisticated Information
Technology. The role of the logistician, however, remains as optimizing the supply chain
by understanding the possibilities of IT and using it to its full potential. Logistics is as
much about the management and movement of information as it is about the management
and movement of physical goods (Hammant, 1995).

At many firms, a relentless search is underway for information technologies that will lead
to efficiency, effectiveness, and differentiation. The effectiveness of information
management is central and critical to the successful execution of logistics and supply
chain responsibilities and processes (Coyle, 2003). Sometime, the whole is greater than
the sum of its parts. (Hickey, 2000)
1.3 Research Purpose and Research Questions

Based on the discussion above, the purpose of this thesis is to provide a clear understanding of how organizations utilize e-Logistics within the Supply Chain.

Based on our research problem, our research questions are following:

RQ1: How can the e-Logistics system be described?

RQ2: How can the factors that influence the e-Logistics system be described?

1.4 Limitations

Due to the limited time to the thesis, we have to narrow our focus to process and systems in logistics house. The factors of people will be avoided in this study. Such a focus has been chosen due to the factors of people is more involved with human resources management.
2 Literature Review

This chapter presents the theoretical framework related to the research questions mentioned in chapter 1.

2.1 The e-Logistics system

Logistics systems are a collection of data, hardware, software, and rules that work together to support an activity. (Dawe, 1995) The e-Logistics is the first to create a complete Transport Management System using only Internet Protocol (IP) based technology. It does not have to be converted to operate on a multi-site basis: it is multi-site based. It differs from other optimization tools, which are focused on consignments from a single site and assume assets can be moved to execute an optimized plan. It provides real-time visibility of the entire transport network and optimizes most efficiently the deployment of those assets to achieve the work to be done to standard. It supports the way transport operations actually work, and completes the entire transport management cycle of forecast, plan, delivery, post delivery and reporting; Plan vs. Actual. Whilst other systems may do parts of this better no other system provides management of the entire process and enables colleagues and business partners to work together collaboratively, streamlining work-flow and reducing administration. (eLOGISTICS.com, 2003) The e-Logistics system can be described by Process, Information System and Value.

The Process of Logistics

According to Coyle (2003), for purposes of illustrating the process of logistics, see Figure 2.1, the authors assume that the model can be applied to a manufacturing firm which has a relationship with a supplier of logistics services.

![Figure 2.1 Process Model for Forming Logistics Relationships](source)

**Figure 2.1** Process Model for Forming Logistics Relationships

**SOURCE:** Adapted from Coyle, 2003, p421

**Step 1: Perform Strategic Assessment.**
When the manufacturer becomes fully aware of its logistics and supply chain needs and the overall strategies, the first stage will be adapted to guide its operations. The result of this step will lead some types of information available.

- Overall business goals and objectives which include those from a corporate, divisional, and logistics perspective
- Needs of assessment to include requirements of customers, suppliers, and key logistics providers
- Identification and analysis of strategic environmental factors and industry trends
- Profile of current logistics network and the firm’s positioning in respective supply chains
- Benchmark values for logistics costs and key performance measurements
- Identification of “gaps” between current and desired measures of logistics performance

This step will give the significance of most decisions in logistics and supply chain relationship, and the potential complexity of the overall process, any time taken at the very beginning of gaining an understanding of one’s needs is well spent.

**Step 2: Decision to Form Relationship.**

This step may take on a slightly different decision context depending on the type of relationship being considered by the manufacturing firm under consideration. The first question is whether or not the provider’s services will be needed when the decision relates to using an external provider of logistics services. A suggestion to making this decision is to make a careful assessment of the areas in which the manufacturing firm appears to have core competency. As indicated in Figure 2.2, for a firm to have core competency in any given area, it must have expertise, strategic fit and ability to invest. If any one or more of these absent may suggest that the services of an external provider are appropriate.

![Figure 2.2 What Does It Take to Have an Area of Core Competency](source: Adapted from Coyle, 2003, p422)

If there is a channel partner such as a supplier or customer involved in the relationship decision, the decision does not focus so much on whether or not to have a relationship but
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on what type of relationship will work best. In either case, the question as to what type of relationship is most appropriate is one that is very important to answer.

According to Lanbert, and et al. (1996), the reasons to partner can be described as Drivers and Facilitators. Drivers are defined as “compelling reasons to partner.” For a relationship to be successful, the theory of the model is that all parties “must believe that they will receive significant benefits in one or more areas and these benefits would not be possible without a partnership” Drivers are strategic factors that may result in a competitive advantage and may help to determine the appropriate type of business relationship. Although there certainly are other factors that may be considered the primary derivers include to following:

- Asset/Cost efficiency
- Customer service
- Marketing advantage
- Profit stability/Growth

The Facilitators are defined as “supportive corporate environmental factors that enhance partnership growth and development.” As such, they are the factors that, if present, can help to ensure the success of relationship. Included among the main types of facilitators are following:

- Corporate compatibility
- Management philosophy and techniques
- Mutuality of commitment to relationship formation
- Symmetry on key factors such as relative size, financial strength, and so on

In addition, a number of additional factors have been identified as keys to successful relationships. Included are factors such as: exclusivity, shared competitors, physical proximity, prior history of working with a partner or the partner, and a shared high-value end user.

Step3: Evaluate Alternatives

According to Coyle (2003), it is important to conduct a thorough assessment of the manufacturing company’s needs and priorities in comparison with capabilities of each potential partner in order to utilize the partnership formation process. This task should be supported by the availability of critical measurements and the results of personal interviews and discussions with the most likely potential partners.

It is frequently advantageous to involve other corporate managers in the overall selection process although logistics executives and mangers usually have significant involvement in the decision to form logistics and supply chain relationships. The staffs in the department of marketing, finance, manufacturing, human resources, and information systems frequently have valuable perspective to contribute to the discussion and analysis. Thus, it is important to assure a broad representation and involvement of people throughout the company in the partnership formation and partner selection decisions. (Coyle, 2003)
Literature Review

Lanbert, and et al. (1996) also suggested a methodology by which the apparent levels of drivers and facilitators may suggest the most appropriate type of relationship to consider. If none of the factors of drivers and facilitators seem to be present, then the recommendation would be for the relationship to be more transactional, or “arm’s length” in nature. Alternatively, when all parties to the relationship share common drivers, and when the facilitating factors seem to be present, then a more structured, formal relationship may be justified.

Step4: Select Partners

This step is the critical concern to the customer. The selection of a logistics partner must be made following very close consideration of the credentials of the most likely candidates. It is also very important to interact with and get to know the final candidates on a professionally intimate basis. (Coyle, 2003)

Step5: Structure Operation Model

The structure of the relationship refers to the activities, processes, and priorities that will be used to build and sustain the relationship (Coyle, 2003). As suggested by Lanbert and et al. (1996), components make the relationship operational and help managers create the benefits of partners, a suggest list of components of operating model include:

- Planning
- Joint operating controls
- Communication
- Risk/Reward sharing
- Trust and commitment
- Contract style
- Scope of the relationship
- Financial investment

Step6: Implementation and continuous Improvement

The most challenging step in the relationship process has just begun after the decision to form a relationship has been made and the structural elements of the relationship identified. The overall implementation process may be relatively short or it may be extended over a longer period of time. In a situation where the degree of change is more modest, the time needed for successful implementation may be abbreviated. (Coyle, 2003)

Finally, the future success of the relationship will be a direct function of the ability of the involved organizations to achieve both continuous and breakthrough improvement. In addition, efforts should be directed to creating the breakthrough, type of improvement that is essential to enhance the functioning of the relationship and the market positioning of the organizations involved. (Coyle. 2003)

The process of e-Logistics

According to Zhang (2001), typical e-Logistics processes include Request For Quotes (RFQ), Shipping, and Tracking. As shown in Figure 2.3
The RFQ process is done by the business process manager in order to get the basic services such as getting the quotes in an e-Logistics process. The purchase order (PO) is updated, whenever the response is obtained. Shipping process is also invoked by the business process manager and upon completion updates the PO. Once goods are shipped, the tracking number is given to the customer and that tracking number is mapped to the PO number in an e-Logistics system. Customers can track their shipment with the help of that number. The interaction diagram of e-Logistics and business process manager is shown in Figure 2.4. (Zhang, 2001)

As illustrated by Ross (2003), the e-Logistics system can be broken down into 19 strategic and tactical objectives which can be organized within a framework of three critical processes: planning and collaboration, transaction, and execution. In addition, the model can determine how information is exchanged by containing a technical infrastructure component, and it also contains an infomediary component which will detail the depth of knowledge and information required to support the capabilities, both internally and externally, to drive the logistics model.
It is critical to acknowledge that not all of the 19 processes will apply to all industries and companies, this model does provide a structured approach to understanding the possible components involved in logistics and transportation. (Ross, 2003)

**Logistics Information System**

Many authors have promoted information technology as a means to enhance logistics competitiveness. Information technology (IT) is one of the few productivity tools that is both increasing in capability and decreasing in cost simultaneously. (Closs, 1997)

According to Coyle (2003) the logistics information system may be defined as:

*An interacting structure of people, equipment, and procedures that together make relevant information available to the logistics manager for the purposes of planning, implementation, and control.*

Figure 2.5 highlights the relationships among the logistics information system, the elements of the logistics environments, and the logistics decision making process.
Planning System

The planning system were referred to as decision support technologies, and the decision support system was defined as an “interactive, computer-based system that provides data and analytic models to help decision makers solve unstructured problems those with many difficult-to-define variables.” With the help of planning system which represents a comprehensive set of computer-oriented tools, the managers can make better decisions and gain broader insight into issues that are strategic to the conduct of logistics and supply chain activities. (Coyle, 2003)

The planning technologies related to such needs as network design, demand planning and forecasting, strategic sourcing, production planning and scheduling, and distribution planning (Coyle, 2003). As suggested in Figure 2.6 Supply Chain Functional Scope: Planning and Execution (A&A Inc., 2000)
As A&A Research Inc. (2000) arrayed three logistics time horizons (Strategic, Tactical, and Operational) against several functional areas of logistics. Powers (1989) made a table that virtually every logistics area requires significant decisions in each of the three time frames. The flexible and capable approaches are the needs of logistics model. The component of logistics planning system, such as approaches and technologies, can be effective in helping to analyze problems such as those listed in Table 2.1.

**Figure 2.6** Supply Chain Functional Scope: Planning and Execution  
**Source:** Adapted from A&A Research Inc. 2000
Table 2.1 Logistics Decisions

<table>
<thead>
<tr>
<th>Subjects of Descriptions</th>
<th>Strategic</th>
<th>Nature of Decisions</th>
<th>Operational</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forecasting</td>
<td>Long range</td>
<td>6-12 months</td>
<td>12-16 weeks</td>
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<td>New Products</td>
<td>Seasonality</td>
<td>Promotions</td>
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<td>Demographic</td>
<td>Marketing impacts</td>
<td>Trends</td>
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<td></td>
<td>shifts</td>
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<tr>
<td>Network design/analysis</td>
<td>Plant and DC</td>
<td>Public</td>
<td>Customer</td>
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<td></td>
<td>locations</td>
<td>warehouses-</td>
<td>reassignments</td>
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<td></td>
<td>Sourcing</td>
<td>usage and</td>
<td>Contingency</td>
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<td></td>
<td>alternatives</td>
<td>assignments</td>
<td>planning</td>
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<tr>
<td>Production planning</td>
<td>Production mix</td>
<td>Production mix</td>
<td>Contingency</td>
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<td></td>
<td>Equipment required</td>
<td>vs. overtime</td>
<td>planning</td>
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<td>Equipment location</td>
<td>Crew planning</td>
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<tr>
<td>Materials planning</td>
<td>Materials and technology alternatives</td>
<td>Stockpiling &amp; contracts</td>
<td>Purchasing</td>
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<td>Inventory levels</td>
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<td>Material releases</td>
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<tr>
<td>Production scheduling</td>
<td>Economic analyses- dedicated lines vs. multiproduct</td>
<td>6-12 month production schedules</td>
<td>Daily/weekly loading and delivery plans</td>
</tr>
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<td></td>
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<td></td>
<td>Billing</td>
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<tr>
<td>Dispatching</td>
<td>Fleet sizing and configuration</td>
<td>Carrier contracts</td>
<td>Daily/weekly loading and delivery plans</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Equipment location</td>
<td>Billing</td>
</tr>
</tbody>
</table>

SOURCE: Adapted from Powers, 1989, p108

Execution System

Logistics execution systems (LES) are finally getting the kind of attention they deserve. These software based tools are finally being talked about in board rooms (Witt, 2004). The technologies that are responsible for the short-term, day-to-day functioning of logistics system included in the LES. Included technologies help to manage activities in areas such as warehousing, transportation, international trade, and inventory (Coyle, 2003).

There are significant advances in the development and utilization of technologies for logistics and supply chain execution recently. In many cases, these technologies are
Research and Intelligence System

According to Coyle (2003), the Logistics Research and Intelligence System scans the environment and makes observations and conclusions available throughout the logistics area and the whole firm, the environment can be checked out in for recognized ways:

- **Undirected View**: General exposure to information when there is no specific purpose.
- **Conditioned Viewing**: Directed exposure, not involving active search, to a more or less clearly identified area of information type.
- **Informal Search**: To obtain specific information with a relatively limited and unstructured search.
- **Formal Search**: A search usually following a pre-established plan, procedure, or methodology to secure specific information or information relating to a specific issue.

Reports and Outputs System

The reports and outputs system is the last in the major part of the logistics information system. Report may serve purposes such as planning, operations, and control. (Coyle, 2003) According to Coyle (2003), there are three kinds of reports:

- **Planning reports**: The reports include information such as sales trends and forecasts, other market information, and economic projections of cost factors, both historic and future-based information.
- **Operation reports**: Typically, these reports make information available to managers on a real-time basis; they provide the information such as current on-hand inventories, purchase and shipping orders, production scheduling and control, and transportation.
- **Control reports**: these reports summarize cost and operating information over relevant time periods, compare budgeted and actual expenses, and provide direct transportation costs. They serve as a basis for strategically redirecting operating approaches and tactics.

According to Closs (1994), logistics information system includes two types of flows, incorporating coordination and operational activities. The key activities within each type of flow are indicated in Figure 2.7. Those that make up the coordination flow include those that are related to scheduling and requirements planning throughout the firm. Operational flow activities relate to the initiation and tracking of receipts, inventory assignment, and shipment of replenishment and customer orders.
Sarkis, and et al. (2004) describes activities and operations within a typical supply chain, with a special emphasis on logistics, the movement of material and products through it. As shown in Figure 2.8, the relationships begin with procurement and introducing materials into the organizational system that named in-bound logistics activities. These materials are transported from various vendors. The central issue for purchasers is the selection of vendors, transportation and delivery services will be considered as two major parts in the selection. These materials are then stored and under the control of the purchasing function. The production (transformation) function in a typical manufacturing organization is composed of assembly and fabrication (service organizations would focus on transformation in different ways, such as information transformation, local transformation, et al.). Outbound logistics includes such activities as transportation determination, packaging, location analysis, warehousing, and inventory management. Marketing’s role is important for activities within this stage of organizational functions. The “use” external activity is the actual consumption of the product, a situation where product stewardship plays a large role. The reverse logistics function may feed directly back to an organization’s internal supply chain or to an external vendor, starting the cycle again.
According to Tilanus (1997), there are 18 different information transactions taking place between parties involved in a piece of goods from one actor in the channel to another. As the channel is extended and more segments are added, the complexity of information grows rapidly as more parties want to timely information and pre-advice of what is happening to the goods. High information quality is then of utmost important in the logistic channel (Coyle, 2003):

- **Having the right information available**: the true needs for information must be understood;
- **Accuracy of information**: the information must be not only right but also fresh and with out error;
- **Understandable communication of information**: the one for whom the information is intended shall be able to understand the meaning of the information without misinterpretations.

The sub-set of information communicated to send one shipment as shown in Figure 2.9
Figure 2.9 The sub-set of information communicated to send one shipment
SOURCE: Adapted from Tilanus, 1997 (p.175)

The value

As figure 2.10 illustrates, there are four principal types of economic utility add value to a product or service. The logistics is a very important aspect in value creation. (Coyle, 2003)
Place utility: Logistics provides place utility by moving goods from the production point to the points where demand exists. Logistics extends the physical boundaries of the market area, thus adding value to the goods. This addition to the economic value of goods or services is known as place utility. Logistics create place utility primarily through transportation. The market boundary extension added by place utility increase competition, which usually leads to lower prices and increased product availability. (Coyle, 2003)

Time utility: Not only must goods and services be available where consumers need them, but they must also be at that point when customers demand them. This is called time utility. It adds value to the goods and services by having it at a demand point at a specific time. Logistics creates time utility through proper inventory maintenance and the strategic location of goods and service. To some extent, transportation may create time utility by moving something more quickly to a point of demand. Time utility is much more important today because of the emphasis upon reducing lead time and minimizing inventory levels through logistics-related strategies. (Coyle, 2003)

According to Lambert (2000), economic value-added can be affected by e-logistics in four aspects:

- **Revenue.** The customer service provided by e-logistics can have a major impact on sales volume and customer retention. If the value of the higher level of service is measured and sold to the customer, there will be less pressure on margins resulting in higher revenue.
- **Operating costs.** The potential for operating cost reduction through e-logistics is considerable. A large proportion of costs in a typical business is driven by e-logistics practices.
- **Working capital.** e-Logistics can have a significant influence on working capital requirements. Long supply chains by definition generate more inventories. Order fills and invoice accuracy directly affect the ability to collect accounts receivable in a timely manner.
- **Fixed assets.** Logistics is asset intensive and in many companies the potential for asset reductions is substantial. Investments in trucks and materials handling equipment can be significant as can be the investment in company-owned as well as leased warehousing facilities.

And also logistics as a function is increasingly viewed as strategically important within the firm (Bienstock, Mentzer, and Bird 1997, Mentzer, Flint, and Huit 2001). Srivastava, Shervani, and Fahey (1999) identified logistics as a core business process and noted the importance of inbound, internal, and outbound logistics. Logistics has a significant impact on corporate profitability (Mentzer and Williams 2001) and firms can use logistics to create a competitive advantage (Bowersox, Mentzer, and Speh 1995; Morash, Droge, and Vickery 1996). Table 2.2 shows the Value from Networked Processes along the Supply Chain for Logistics.
Table 2.2 Value from Networked Processes along the Supply Chain for Logistics

<table>
<thead>
<tr>
<th>Networked Processes</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design and product management</td>
<td>• Competitive advantage through faster time-to-market • Reduced R and D expenses • Lower unit costs</td>
</tr>
<tr>
<td>Order management, planning, forecasting and replenishment</td>
<td>• Competitive advantage and higher revenues from reduced stock outs • Lower costs through reduced inventory • Lower costs through reduced return rates</td>
</tr>
<tr>
<td>Distribution</td>
<td>• Lower costs through optimised shipping and fulfillment</td>
</tr>
<tr>
<td>Sourcing</td>
<td>• Competitive advantage and increased revenue through faster product introductions • Decreased costs through and increased revenue from higher quality</td>
</tr>
<tr>
<td>Customer relationship management</td>
<td>• Increased revenue through improved customer segmenting and targeting • Increased revenue through improved customer service • Decreased costs from efficient salesforce automation</td>
</tr>
<tr>
<td>Merchandising/Category management</td>
<td>• Competitive advantage and increased revenue through the proper product assortment, pricing and promotional strategies, and shelf placement</td>
</tr>
</tbody>
</table>

SOURCE: Adapted from Benchmarking Partners, Inc., 1999 (http://www.benchmarking.com)

2.2 The factors that influence the e-Logistics system

According to Blanchard (1998), logistics requirements must be initially specified, both in quantitative and qualitative terms. As system development progresses, exogenous factors that influence the use of e-Logistics system must be considered, some of particular significant logistics factors are summarized as below:

- Reliability factors
- Maintainability factors
- Supply support factors
- Test and support equipment factors
- Organizational factors
- Facility, transportation, and handling factors
- Software factors
- Availability factors
- Economic factors and Effectiveness factors.

Reliability factors
Some view reliability as the likelihood that the product will not break. There is more to it than that: “Reliability is the probability that an item will perform its intended function for
Literature Review

...a specified interval in a stated condition.” (Gerstle, 2004). The frequency of maintenance for a given item is highly dependent on the reliability of that item. In general, as the reliability of a system increases, the frequency of maintenance will decrease, and vice versa. Unreliable systems will usually require extensive maintenance. (Blanchard, 1998)

Maintainability factors
Maintainability is an inherent design characteristic dealing with the ease, accuracy, safety, and economy in the performance of maintenance functions. Maintainability, defined in the broadest sense, can be influenced in terms of a combination of elapsed times, personnel labor-hour rates, maintenance frequencies, maintenance cost, and related logistic support factors. Maintenance activities are typically classified according to increasing level of proactivity: corrective maintenance, preventive maintenance, reliability, predictive maintenance, self-maintenance, and tele-maintenance (LOGTECH, 2002).

Maintenance time is made up of the individual task times associated with the required maintenance actions, such as corrective and preventive actions, for a given system or product. Maintainability is therefore an influence of the ease and rapidity with which a system can be maintained, and is influenced in terms of the time required to perform maintenance tasks. (Blanchard, 1998)

Supply support factors
Supply support encompasses all management procedures and techniques used to acquire, catalogue, receive, store, transfer, issue and dispose of all secondary items, including provisioning for initial support (Galloway, 1996). Specially, supply support includes the spare parts and the associated inventories necessary for the accomplishment of unscheduled and scheduled maintenance actions (Blanchard, 1998).

Among the resources which are necessary to achieve maintenance tasks by replacement or repair, the spare-parts take a very specific place due to the potential impact of their unavailability. Spare-part requirements are initially based on the system maintenance concept and are subsequently defined and justified through the logistic support analysis. Defined in accordance with the maintenance policy, the supply management strategy mainly determined the range of spare elements, their mode of supply, as well as their geographical dispatch (Francois Peres, 2002). At each maintenance level, one must determine the type of spare part and the quantity of items to be purchased and stocked. Also, it is necessary to know how often various items should be ordered and the number of items that should be procured in a given purchasing transaction (Blanchard, 1998).

Test and support equipment factors
The general category of test and support equipment may include a wide spectrum of items, such as precision electronic test equipment, mechanical test equipment, ground handling equipment, maintenance stands, and the like. These items, in varying configurations and mixes, may be assigned to different maintenance locations. However, regardless of the nature and application, the objective is to provide the right item for the job intended, at the proper location, and in the quantity required. (Blanchard, 1998)

When determining the specific test equipment requirements, one must define the type of items that will be returned for maintenance; the test functions to be accomplished, and the anticipated frequency of test functions per unit of time. The type and frequency of item
returns is based on the maintenance concept and system reliability data. Given the test equipment utilization needs, it is necessary to determine the anticipated reliability and maintainability of the test equipment configuration being considered for the application. Obviously, the test equipment configuration should be more reliable than the system component being tested. The final determination of the requirements for test equipment in a maintenance facility is accomplished through an analysis of various alternative combinations of arrival rates, queue length, test station process times, and quantity of test stations. (Blanchard, 1998)

Organizational factors
The influences associated with a maintenance organization are basically the same as those factors which are typical for any organization. Of particular interest relative to logistic support are:

- The direct maintenance labor time for each personnel category, or skill level, expended in the performance of system maintenance activities.
- The indirect labor time required to support system maintenance activities (i.e., overhead factor).
- The personnel attrition rate or turnover rate (in percent).
- The personnel training rate or the worker-days of formal training per year of system operation and support.
- The number of maintenance work orders processed per unit of time (e.g., week, month, or year), and the average time required for work order processing.
- The average administrative delay time, or the average time from when an item is initially received for maintenance to the point when active maintenance on that item actually begins.

When addressing the total spectrum of logistics (and the design for supportability), the organizational element is critical to the effective and successful lifecycle support of a system. The right personnel quantities and skills must be available when required, and the individuals assigned to the job must be properly trained and motivated. This is especially important for small enterprises (Halley and Guilhon, 1997).

Facility, transportation, and handling factors
Facilities include the planning, acquisition and management of permanent or semi-permanent real-estate and property assets required to support the system (Galloway, 1996). These are required to support activities pertaining to the accomplishment of active maintenance tasks, providing warehousing functions for spares and repair parts, and providing housing for related administrative functions. The following are considered to be the most common factors:

- Item process time or turnaround time
- Facility utilization
- Energy utilization in the performance of maintenance
- Total facility cost for system operation and support

Transportation requirements include the movement of human and material resources between the sources of supply and the various locations where maintenance activities are accomplished. For instance, personnel and materials are often dispatched from a remote maintenance facility to a consumer location to provide needed on-site maintenance support. In essence, transportation plays a key role in the area of logistic support, activities and is one of the key elements of the logistic functions aimed at expanding the
production system as a whole and can be considered as strategic activities linking all the operators along the value-chain (Calza and Passaro, 1997). When evaluating the effectiveness of transportation, one must deal with such factors as:

- Transportation route
- Transportation capacity or capability
- Transportation time.
- Transportation cost

Transportation and handling factors are significant with regard to the design of a system for transportability or mobility. Transportation requirements must be defined and the system (and its elements) must be designed such that the required transportation and handling activities can be accomplished both effectively and efficiently. The factors identified here, particularly transportation time and cost, are required input parameters in performing logistic support and life-cycle cost analyses. (Blanchard, 1998)

**Software factors**

For many systems, software has become a major element of support. This is particularly true where automation, computer applications, digital data bases are used in the accomplishment of maintenance and logistics functions. As with equipment, reliability and quality are significant considerations in the development of software.

Although software does not degrade in the same way as equipment, the reliability of software is still important and must be influenced. In the specification and development of system software, applicable influence factors must be identified and the system must be influenced to include consideration of equipment, personnel, facilities, data, consumables, and software. (Blanchard, 1998)

**Availability factors**

The term availability is often used as an influence of system readiness (i.e., the degree, percent, or probability that a system will be ready or available when required for use). Availability may be expressed differently, depending on the system, and its mission. Three commonly used figures of merit are described as inherent availability, achieved availability, operational availability. (Blanchard, 1998)

**Economic factor and effectiveness factors**

The recent combination of economic trends, rising inflation, cost growth experienced for many systems and products, the continuing reduction in “buying power”, budget limitations, and so on, has created an awareness and interest in total system cost. Not only are the acquisition costs associated with new system rising, but the cost of operating and maintaining systems already in use are increasing at alarming rates. The net result is that less money is available to meet new requirements, as well as maintaining systems that are already in being. In essence, many of the systems in existence today are not truly cost-effective. (Blanchard, 1998)

The aspect of effectiveness introduced can be quantified in terms of one or more figures of merit, depending on the specific mission or system characteristics that one wishes to specify and influence. Effectiveness must consider

- System performance and physical parameters, e.g. capacity, delivery rate, range, accuracy, volume, speed, weight, and so on.
2.3 Conceptual Framework

According to Silverman (2000), the conceptual framework is built from a set of concepts linked to existing methods, behaviors, functions, relationships and objects. Miles and Huberman (1994) state that the conceptual framework is a graphically or narrative form that to explain the main studies.

After the literatures had been reviewed, the theories are conceptualized in the way to explain our research questions.

2.3.1 The e-Logistics System

The theories relevant to answer the first research question, *How can the e-Logistics system be described*, is following.

*The Process of e-Logistics*

Zhang’s (2001) description about the process of e-Logistics is adopted in our research since our study focus mostly on the online systems that are published in recent years and contain the detail processes of e-Logistics.

According to Zhang (2001), typical e-Logistics processes include:
- Request For Quotes (RFQ)
- Shipping
- Tracking

*Logistics Information System*

The model of logistics information system which was made by Coyle (2003) will be applied to our research since Coyle explain it in a very extensive way.

According to Coyle (2003), the Logistics Information System contains:
- Planning system
- Execution system
- Research and intelligence system
- Reports and outputs system

*Value*

According to Coyle (2003), the logistics create value in two utility as following:
- Place utility
- Time utility

Further, Lambert’s (2000)’s discussion of economic value-added by logistics can be concluded in four aspects:
We adopted those theories because they are extensive and can help us to collect rich data.

2.3.2 The factors that influence the e-Logistics system

The theories relevant to answer the second research question two: how can the factors that influence the e-Logistics system be described, is following.

Blanchard's (1998) discussion of factors that influence the e-Logistics system will be mainly applied to our research. Regarding to some detail factors that Blanchard didn’t mention, we also use the Gerstle’s (2004), LOGTECH’s (2002), Galloway’s (1996), Francois’ (2002), Halley and Guilhon’s (1997) and Calza and Passaro’s (1997) discussions to make it more extensive. There are:

- Reliability factors
- Maintainability factors
- Supply support factors
- Test and support equipment factors
- Organizational factors
- Facility, transportation, and handling factors
- Software factors
- Availability factors
- Economic factors, and Effectiveness factors

The reason for applying this literature to the study is that it is extensive covered every aspect in a logistic system.

2.3.3 Frame of Reference

We have formulated the research problem and the research questions, and furthermore conceptualized the frame of reference for this study. This frame of reference is presented graphically in Figure 2.11, and it will allow us to answer to our research questions and research problem. The framework guides us to find out how can the e-Logistics system be described and how the factors that influence the e-Logistics system can be described.
The e-Logistics system can be described by the process, the information system and the value first, and then the overall factors that influence the e-Logistics system should be considered. After answering the two research questions, it’s easy to find out the answer of how organizations utilize e-Logistics to create value within supply chain.
3. Methodology

In this chapter, we will explain and justify the research methods that we adopted to explain our research questions.

Figure 3.1 Research Methodology
Source: Adapted from Foster (1998), p81

3.1 Research Purpose

Enquiries can be classified in terms of their purpose as well as by the research strategy used (Robson, 2002). There are three different classifications, exploratory, descriptive and explanatory. In the same way as you may employ more than one strategy in your research project, so you may have more than one purpose. Indeed as Robson (2002) points out, the purpose of your enquiry may change over time.

Exploratory Study is a study investigating an entirely new area of research. Unlike replications and exploratory study does not follow directly from an existing study (Mitchell and Jolley, 1998). Robson defined that exploratory studies are a valuable means of finding out ‘what is happening’ to seek new insight; to ask questions and to assess phenomena in a new light (Robson, 2002).

There are three principal ways of conducting exploratory research:

- A search of the literature;
- Talking to experts in the subject;
- Conducting focus group interviews.

Exploratory research can be likened to the activities of the traveler or explorer (Adam and Schvaneveldt, 1991). Its great advantage is that it is flexible and adaptable to change. If you are conducting exploratory research you must be willing to change your direction as a result of new data that appears and new insights that occur to you (Saunders and et al., 2003).

Adams and Schvaneveldt (1991) reinforce this point by arguing that the flexibility inherent in exploratory research does not mean absence of direction to the enquiry. What is does mean is that the focus is initially broad and becomes progressively narrower as the research progresses.
The object of descriptive research is to portray an accurate profile of persons, events or situations (Robson, 2002). This may be an extension of, or a forerunner to, a piece of exploratory research. It is necessary to have a clear picture of the phenomena on which you wish to collect data prior to the collection of the data (Saunders and et al., 2003). The authors also claim that in a research work, you need to go further and draw conclusion from your data. You should develop the skills of evaluating data and synthesizing ideas. These are higher-order skills than those of accurate description. Description in management and business research has a very clear place. However, it should be thought of as a means to an end rather than an end in itself.

Studies that establish causal relationships between variables may be termed explanatory studies. The emphasis here is on studying a situation or a problem in order to explain the relationships between variables. You may find, for example, that a cursory analysis of quantitative data on manufacturing scrap rates shows a relationship between scrap rates and the age of the machine being operated. You could go ahead and subject the data to statistical tests such as correlation in order to get a clearer view of the relationship (Saunders and et al., 2003).

Based on our research questions, our research purpose is exploratory partly since we want to gain a better understanding of how organizations utilize e-Logistics to create value within the Supply Chain. We will conduct exploratory studies by searching the literature in the library, database and the company’s internal documents and talking with the experts in this area. And we are descriptive since we want to portray the process, the system, the value and the influencing factors of the e-Logistics system. We are also partly explanatory since we try to draw conclusions by answering our research questions by our findings. Generally speaking, since our research problem is to portray an accurate profile of e-Logistics system and the value creation so our research purpose is primarily descriptive.

3.2 Research Approach

According to Martilla, and et al., (1999), description studies naturally lead to qualitative research. The authors also provide a detailed discussion of how qualitative research is defined by different scholars. The authors demonstrated that qualitative research definitions can range from “any kind of research that produces findings not arrived at by means of statistical procedures or other means of quantification” to five-step process including “(a) finding a topic, (b) formulating research questions, (c) gathering the evidence, (d) interpreting the evidence and (e) telling the research story”. Silverman (1993) attempted to do just this. He described three distinctive characteristics of qualitative research outlined by Hammersley and Atkinson (1983). Two of the characteristics seem especially relevant for our purpose. First, “field research can provide a broader version of theory than simply a relationship between variables” (Silverman, 1993). In other words, a more general version of a theory is one that takes into consideration the mechanisms or processes that generate the relationship among the identified variables (Martilla, and et al., 1999). Second, “the flexibility of field research ‘allows theory development to be pursued in a highly effective and economical manner’” (Silverman, 1993). In this way, additional, more interesting questions can be generated by allowing the research to be flexible and possible move in directions or observe phenomena that ordinarily would have been missed or taken for granted (Saunders and et al., 2003).
3.3 Research Strategy

Case study is office used when conducting a qualitative research (Denzin and Lincoln, 2000). Robson (2002) defines case study as a strategy for doing research which involves an empirical investigation of a particular contemporary phenomenon within its real life context using multiple sources of evidence. This strategy will be of particular interest to you if you wish to gain a rich understanding of the context of the research and the processes being enacted (Morris and Wood, 1991). The case study strategy also has considerable ability to generate answers to the question ‘Why?’ as well as the ‘What?’ and ‘How?’ (Martilla, and et al., 1999). Yin (2003) recommended the design of a case study can either be a single-case study or a multiple case study. The same study may contain more than a single case and then a multiple-case design should be adopted, and such design had a great increase in recent years. Also, a multiple design must follow a replication rather than sampling logic. According to Miles and Huberman (1994), the confidence to findings, the precision, the validity, and the stability of the findings will be increased by adapting multiple-case study.

Our research questions are of ‘How’ character. The questions deal with operational links needing to be traced over time and they are a contemporary set of events, over which we, the investigator, has no control. Furthermore, the data will be collected and analyzed in order to compare with the existing theories and give us the opportunity to make comparisons between two cases and finally to detect possible similarities or differences. As we discussed above, and also by the requirement of reliability and the validity, we found a better suited research strategy for our research – multiple case study.

3.4 Data Collection

After deciding the most suited research strategy we had to decide how to collect our empirical data for our purpose. According to Yin (2003), the data collection process for case studies is more complex, such as document, interview, archive and observation. Because our research only needs an in-depth data, we will use interview since we have a certain set of questions and also use documentation as our main source of data collection.

An interview is a purposeful discussion between two or more people. The use of interviews can help you to gather valid and reliable data that are relevant to your research questions and objectives (Saunders and et al., 2003).

The different type of interview:
- Structured interviews;
- Semi-structured interviews;
- Unstructured interview.
Structured interviews use questionnaires based on a predetermined and standardized or identical set of questions. By comparison, semi-structured and unstructured interviews are non-standardized (Saunders and et al., 2003).

We may also differentiate between types of interviews related to the form of interaction that is established between the researcher and those who participate in this process. Figure 3.2 is the forms of qualitative interview (Saunders and et al., 2003).

![Forms of qualitative interview](source)

**Figure 3.2** Forms of qualitative interview

**SOURCE:** Adapted from Saunders and et al., 2003 (p247)

In this research, according to Robson claimed in an exploratory study, in-depth interviews can be very helpful to ‘find out what is happening and to seek new insights’ (Robson, 2002), the structured and one to one interviews were adopted, we set two face-to-face interviews and two telephone interviews. The telephone interview was chosen because the long distance between us and respondent.

To complete the interviews and gain as more information as possible, we also use websites and internal documents.

### 3.5 Sample Selection

According to Saunders, and et al. (2003), Non-probability sampling provides a range of alternative techniques based on your subjective judgment. Purposive sampling or judgemental sampling is a non-probability sampling method that enables you to use your judgement to select case that will best enable you to answer your research questions and to meet your objectives. When working with very small sample such as in case study research, this form of sample is often used.

Our choice of sample is dependent on the feasibility and sensibility of collecting data to answer research questions. As Yin (2003) recommended when use the multiple-case study, each case must be carefully selected so that is predicts similar results. Based on the previous discussion we end up with the following companies: Volvo Logistics Corporation (VLC) located in Göteborg, Sweden, a sister company within the Volvo Group, the company develops and provides transport and logistics solutions for the Volvo Group as a whole; and Haier Logistics Corporation (HLC), located in Qingdao, China, also a sister company within the Haier Group, the company not only provider logistic
services for Haier Group but also provide the services for more than forty international companies, such as Nestlé, AFP, HP and etc. Our case no. one is Volvo Logistics Corporation (VLC) and case no. two is Haier Logistics Corporation (HLC).

We got contact with our respondents in VLC, Mats Jonson and Maria Ingemarsson through a meeting at VLC. Mr. Jonson has been an employee in VLC since 1999 and is responsible for the region Scandinavia and overseas inbound logistic and Mrs. Ingemarsson worked in Global Outbound Contracting for five years. Furthermore, our respondents in HLC, Mr. Tao Li and Mr. Qilin Wang were forwarded to us through international telephone interviews. Mr. Li had joined HLC at 2004 and is responsible for the region Chongqing logistics as a manager, he is also considered as the youngest manager in HLC. Mr. Wang currently worked as a manager of Haier Logistics Execution System, and he has been an employee in HLC for seven years.

3.6 Data Analysis

Qualitative researchers have their own data analysis procedures. In many regards, the data analysis involved with qualitative research methods is much more difficult to complete than in quantitative research (Martrlla, and et al., 1999). We selected a qualitative research so we attempt to gather data from several sources to aid in the validation of the data collection. As can be seen, there can be difficulty with qualitative data analysis. The analysis of qualitative data is not nearly as straightforward as quantitative data and requires a great deal more thought and effort to do well (Martrlla, and et al., 1999).

According to Miles and Huberman (1994) the process of analysis is composed of three concurrent subprocesses, which are data reduction, data display and drawing, and verifying conclusions. As part of the process of analysis, data reduction includes summarizing and simplifying the data collected and/or selectively focusing on some parts of this data. The aim of this process is to transform the data and to condense it. Miles and Huberman (1994) outline a number of methods for reducing data; these include the production of interview or observation summaries, document summaries, interim summaries, coding and categorizing data, and writing memos (Saunders and et al., 2003).

Data display involves organizing and assembling your reduced or selected data into diagrammatic or visual display. Miles and Huberman describe a number of ways of displaying data, and refer to two main families of data display: matrices and networks. Matrices are generally tabular in form, with defined columns and rows, where data are selectively entered into the appropriate cells of such a matrix. A network is a collection of nodes or boxes that are joined or linked by lines, perhaps with arrows to indicate relationships. The boxes or nodes contain brief descriptions or labels to indicate variables or key points from the data (Saunders and et al., 2003).

Conclusion drawing and verification is the stage where the researcher decides the meaning of occurrences, noting regularities, patterns, explanations, possible configurations, casual flows, and propositions (Miles and Huberman's, 1994).

In our research, we will follow these three steps to analyze our empirical data. We first reduce the data concerning our research questions. After that the empirical findings will
be compared with the frame of reference through a within-case analysis. The data will display in a cross case analysis. The cross-case analysis was conducted by comparing the findings, and discover patterns of the different cases to each other (Miles and Huberman's, 1994).

3.7 Quality Standards

Reliability and validity are crucial aspects of research practice and the importance of these criteria should be fully recognized by all who are engaged in survey work of any kind. These terms are not always readily distinguished; some degree of overlap seems almost inevitable and they are, in any case interconnected (Chisnall, 1997).

Reliability

Reliability refers to the stability and consistency of the results derived from research: to the probability that the same results could be obtained if the measures used in the research were replicated. Perfect coincidence of such measures would not be likely, however, and acceptability could range over specified limits, expressed in the form of correlation coefficients. Essentially, reliability is concerned with the consistency, accuracy and predictability of specific research findings (Chisnall, 1997).

To increase the reliability, first, for case VLC, we sent a person in our group to have an investigation at VLC, Göteborg, we choose two qualified persons to do the interviews based on the responsibility of their post in the company, for case HLC, one person who we will have a interview with is the classmate of a person in our group, and we are sure about that he will do his best to help us, and then the whole working group was involved in the construction and analysis of our interview questions. In that way we made sure that the questions were clear and easy to understand. Since the VLC’s headquarter is situated in Göteborg, Sweden, we will conduct the face-to-face interviews through a meeting at VLC, both of us will attend the interviews, one will take the responsibility of asking the questions and the other will do the record. But, the HLC’s headquarter is suited in Qingdao, China, the face-to-face interviews was not a realistic option. We saw two main options how to carry out the interview, by e-mail or telephone. We preferred to do it over telephone and also use e-mail as the documents; the risk of misunderstandings would be reduced if they had the possibility to ask about questions. During the interview the answers to the questions will be recorded on the mp3 player. After the interview the answers will be compiled at once. In that way the risk of forgetting information, not yet remember, would be lower. One reliability problem could be that only two persons performed the interview in each case. That could imply a risk that the answer partly is colored by this person’s understanding.

Validity

For a research measure to be valid, it must also be reliable. But if it is reliable, it may or may not be valid. Hence, reliability is a necessary but not sufficient condition for validity. Validity refers to how well a specific research method measures what it claims to measure. It is generally more difficult to resolve validity than reliability. (Chisnall, 1997)
Methodology

According to Yin (2003), to construct validity, there are three principles: Use multiple sources of evidence; Establish chain of evidence; and Have key informants review draft case study report. We choose interviews and documents as our main source of evidence, and we also send a person to VLC in order to talk with them. In this study, we have made references to the data which we will collect. And our supervisor has reviewed every draft we have made, and we also have an approval from our supervisor after we construct the interview guide.

Due to our research purpose, we tried to construct the validity by setting the interview questions clear and easy to answer and not drawing any major generalizations of companies using e-logistics system in value creation as a whole in our conclusion. The interviews of HLC were conducted in Chinese and later translated to English that would have a risk for translation errors. However we decide to do the interview in Chinese since the respondent may not understand our questions very well, we try to reduce the possibility for wrongly translating by double-checking the record of interviews. Our final implications for further research have also contributed to the increase of the external validity.
3.8 Summary

Here we make a whole view of our research methodology in Figure 3.3

RQ1: How can the e-Logistics system be described?
RQ2: How can the factors that influence the e-Logistics system be described?

Research Purpose

Research Approach

Research Strategy

Data Collection

Data Analysis

Exploratory

Descriptive

Explanatory

Qualitative

Multiple Case Study

Interview

Documentation

Within-case Analysis

Cross Case Analysis

Quality Standards: Build Validity and Reliability

Figure 3.3 Our research methodology
4. Empirical Data

The empirical data from the selected companies will be presented in this chapter. At the beginning, we will present a background of the company and then the data collected will be presented by the order of our research questions. Therefore, this chapter will include the description of e-Logistics system and the factors that influence the e-Logistics system.

4.1 Case One: Volvo Logistics Corporation (VLC)

The Volvo Group

Volvo, the largest industrial company in Sweden, started its business as a car manufacturer in 1927 and is today a broad enterprise within the transportation manufacturing industry. The Volvo Group have evolved into several different business areas, trucks, buses, construction equipment, marine and industrial engine manufacturing, civilian and military aviation engine equipment and financial services.

On the 6th of September 1925, two men Assar Gabrielsson, the businessman and Gustaf Larson, the technician had a mutual idea of starting a car manufacturing company. Both of them had investigated the possibility of establishing car manufacturing in Sweden. The name Volvo is Latin and stands for “I roll”. A year and a half later on the 14th of April 1927 the first car, “Jakob” rolled out from the factory in Göteborg. The first car was a success and a year later the first truck was shown to the public.

The years that followed, Volvo saw opportunities to start manufacturing in various fields within the transportation sector. Aircraft engines for both civilian and military use, construction equipment such as articulated haulers and excavators were introduced to the marketplace.

Volvo quickly became known for its innovation ability, and holds several patents that have revolutionised the industry. Volvo invented the seat-belt and became the first car manufacturer to install seat-belts as standard equipment. Volvos focus has always been on safety and environmental care for their customers in whatever field they produce products. This has led to the fact that the name is synonymous with safety and reliability.

In 1999, Volvo sold its car manufacturing company to Ford Motor Corporation. Volvo felt it could not keep up with the fierce competition within this field themselves and felt that the car manufacturing company would need the support of a larger owner. The cost of developing new models was something that prompted the sale. Volvo Car Corporation (VCC) is now a subsidiary of Ford Motor Corporation.

Even though the car manufacturing company and Volvo companies do not belong to the same corporation anymore, there exists collaboration on the technical and service side. One such collaboration is between Volvo Logistics Corporation, which is a sister company to AB Volvo, and Volvo Car Corporation.

Volvo Logistics Corporation handles all the material movements to all the car manufacturing facilities. VLC also handles the shipments from the factory to the end
Empirical Data

Volvo Car Corporation is considered to manufacture premium cars, the corporation is now included in Ford Motor Company and contributes some 120,000 million SEK to Ford and employs 27,000 people.

The turnover for the Volvo Group in 2002 was 177,080 million SEK, which was a decrease of 2% from the previous year. The group employed 70,546 people during 2002 which is an increase of 500 staff members from the year before. The structure of Volvo group can be seen in Figure 4.1.

![AB Volvo structure](source: Volvo Logistics Corporation)

Volvo Logistics Corporation (VLC) is a sister company within the Volvo Group, the company develops and provides transport and logistics solutions for the Volvo Group as a whole. Its main customer is Volvo Car Corporation (VCC), which now is owned by the Ford Motor Company. When VCC was sold, VLC went from having its main customer within the Volvo group, to having an external customer from the group. Having its main source of business external of the Volvo group, means that VLC is very dependent upon VCC. In 2001 VCC stood for 49% of the total turnover Therefore VLC now concentrates on minimizing its dependence on the car corporation, by handling more of the material movements for the different sub companies within the Volvo Group. There is also a great deal of concentration on trying to find customers external to the Volvo Group. An illustration of the various customers that VLC has within the Volvo Groups as the external customers can be found in Figure 4.2.
Today VLC employs around 800 staff members worldwide. In North America and Europe there are around 120 staff members respectively. In 2002 the total turnover for the corporation was SEK 6 billion which was an increase from SEK 4 billion in 2000. The reason for the big increase is because of the transition of handling more of the material movements for the entire group.

Volvo Logistics Corporation is divided into three major business areas, Volvo Logistics Scandinavia & Overseas, Volvo Logistics Europe and Volvo Logistics North America. Within Volvo Logistics Scandinavia & Overseas (VLSO) there are three subdivisions, Inbound, Outbound and Packaging and wrapping. Inbound handles all the material movements between the factories within the Volvo Group, there are 130 factories and warehouses in total that are supplied with material from the inbound division. Outbound handles the movement of the finished products from the factories such as cars, trucks and buses to the end customer. Packaging & wrapping handles all the surrounding material required to ensure that a correct and safe transfer of the goods is conducted. An overview of VLC can be seen in Figure 4.3.

Figure 4.2 Customer base for Volvo Logistics
SOURCE: Volvo Logistics Corporation
4.1.1 RQ1: How can the e-Logistics system be described?

The Process of e-Logistics

The respondents state they are using the e-Logistics system, and they state the process of e-Logistics as following: There are three main types of logistics as following:

The whole e-Logistics system can be seen in Figure 4.4

First, emballage: it included Material Release/Booking, Packaging Design and Packaging Material. The business concept of Volvo Emballage is to provide a total solution of packaging for customers in the automotive and manufacturing industries by superior knowledge and performance. One of VLC's services is standard packaging, which VLC
Empirical Data

distribute in an effective manner to VLC’s customers’ suppliers and which they then use
to send goods to their customers. VLC then distribute this packaging again to a nearby
user in the system. This ensures that the distance the packaging is transported while
empty is as cost effective as it can possibly be. With VLC, the customer can choose
between using VLC’s standard range of packaging and having packaging material
custom-made for them. The system is the same and VLC provide them with full control
over the packaging and its costs. If they use VLC’s standard range, VLC own the
packaging and they only pay when they use it. If they need special packaging, VLC can
help them to design and make it in line with their requirements. If they already have their
own packaging, VLC can help them by means of VLC’s system to have full control over
it. Just like a bank VLC gives the customers online statements of their packaging material
accounts. In addition, this information is always available on VLC’s web-based service,
Emballage Pool Online. The support information system is Volvo Emballage Managing
System (V-EMS) which is a Packaging Management System. And the respondents also
stated how it works as following: put simply, it’s all about optimizing packaging logistics
in order to minimize customers' costs. With the help of a wide product range and an
efficient distribution network, VLC can give customers access to the right packaging,
wherever they are in the world. The system is simple - every customer uses packaging
which comes from an earlier link in the chain or direct from VLC. All customers need do
is order the packaging from VLC, using an easily completed standard form.

Second, inbound: it included Cargo Transportation, Warehousing, Subassembly, and
Kitting and Sequence delivery. Detailed analyses of each specific situation and
requirements always precede the creation of material flows. VLC’s transport companies
are able to comply with their rigorous requirements relating to lead times, delivery
precision and total economy for each individual part of the journey. In order to ensure a
reliable material flow pattern, VLC participate at an early stage in the design of the
logistics system in connection with the whole industrial structure. VLC supports
customer studies of developing new products or production plants. VLC also evaluates
different material supply scenarios. VLC work primarily with two types of material flow:
Full load trailers directly from supplier to the final use point, and so-called "milk-runs"
(multi-stop pick-up). This latter encompasses an organized transport schedule from
several suppliers, following a pre-determined route. VLC buys in all the necessary
transport services, while operation of the terminal itself is either handled in-house or
bought in from outside. If the transport services are provided by others, VLC involved
with transport management which means VLC monitors all deliveries and ensure that
they arrive on time and traffic development which is about maintaining and constantly
fine-tuning the transport systems and operating frameworks for all transportation. In
addition to this, VLC also operates with storage, sequencing, pre-assembly and goods
reception.

Third, outbound: it included Distribution centre, Handling and Distribution. It focuses on
ensuring that undamaged vehicles reach every recipient on the promised date. VLC get
ability to design highly complex and efficient distribution networks with experience and
cooperation with customers. Networks guarantee that large volumes of customer-tailored
vehicles will be delivered on the agreed date, directly to the agreed customer and without
any time-consuming and costly intermediate stops. VLC continuously evaluate their
distribution systems. A constant process of improvement is a natural ingredient. They
also try to inspire all their partners to work actively to meet forthcoming rules and needs.
VLC offer complete services within the outbound area and utilize the possibilities all
different brands and type of cars and heavy vehicles gives for logistic combinations. In full co-operation with the customer VLC undertakes responsibility in the following areas: Support product design phase; Logistics development; Damage prevention; Transport purchasing; Operational management; Follow-up and report.

And the process of e-Logistics can be seen in Figure 4.5

![The Process of e-Logistics](image)

**Figure 4.5** An Overview of the Process of e-Logistics system  
**SOURCE:** Volvo Logistics Corporation

The respondents states that: the shipping management and the tracking management is involved in the whole e-Logistics system and the RFQ is used in contracting process. Contracting is responsible for purchasing of transport and logistics services. Contracting is performed for external transport and logistics needs, on behalf of the processes Inbound, Outbound, Aviation and Emballage of Volvo Logistics for its customers. Once goods are shipped, the tracking number is given to the customer and that tracking number is recorded on the Internet. Customers can track their shipment with the help of that number.

**The Logistics Information System**

The respondents states that they use different information systems and e-tools in different stages.

In emballage and inbound part, they use ATLAS project (Advanced Total Logistics for Automotive Supply) and adapt GC3 (G-Log’s Global Command and Control Center)’s software named Volvo Emballage Managing System (V-EMS) as their logistics information system. Atlas will always have updated real-time information about all relevant activities in the material supply process, and will enable us to provide proposals regarding the best transport solution for each individual customer. This will make it a valuable tool in their constant efforts to further improve the delivery precision – from 95 to 98 percent in terms of hourly precision. The ATLAS system is responsible for delivering a configured and rolled-out application to customers, VLC Inbound organization, suppliers and carriers i.e. the ATLAS system is responsible for securing that the processes are efficient and that the IT-system is used as designed and planned.
As the respondents state, there are four major activities in Atlas project as following: the first major activity is that: define requirements and design the e-Logistic process; the second is that: implement the web application to support the collection of the data of transport booking, proof of collection, proof of delivery, pre-arrival notification, and transport status, and implement system administration functionality, aster that harmonize necessary master data; the third is that: configure, implement and roll-out of new transport execution system which deliver basic cross dock functionality, deliver goods-pre reception functionality, deliver track and trace functionality and deliver tools and reports to measure supplier and carrier KPIs; The last is that: deliver transport planning (including operational optimization) functionality, deliver event management functionality, configure, implement and roll-out of new settlement system, deliver self-billing functionality, deliver reports to measure financial KPIs and tactical optimization.

The respondents state that with V-EMS, VLC benefits from a Web-based technology that is less expensive to manage, operate and maintain. When fully implemented, logistics information will be accessible on a global basis, through an Internet browser, to those granted access, including customers and suppliers. The V-EMS gives every VLC's business unit increased flexibility and better access to global logistics data. The V-EMS software provides end-to-end visibility information that is frequently updated and can be specifically tailored to the decision-making requirements of every collaborative partner in the network. In addition to enjoying detailed, real-time visibility data, every VLC business unit will benefit from the V-EMS’s ability to proactively react to unexpected supply chain events — such as shipment delays or short-shipped quantities — and to manage by exception, ultimately ensuring that every shipment is delivered in an optimal manner. The V-EMS software can synchronize transportation activity across VLC’s entire supply chain network, enabling better inventory management and increased throughput for the company as well as its customers and suppliers.

In outbound part, they use A4D (Applications for Distribution) as their logistics information system. This is the name of VLC's unique e-business platform that links together and provides current information throughout the order-production-distribution sequence. All global transport paths are integrated into the system, which calculates the delivery date as soon as the customer orders his car. The major functions of A4D can be seen in Figure 4.6.
Figure 4.6 The Major Functions of A4D system, Overview

**SOURCE:** Volvo Logistics Corporation

**Calculation of Distribution Start and End Date**

Based on different kind of master data A4D calculates promised delivery date/ETA and the latest possible starting date for the distribution process. Calculations can be based on Requested Delivery Date or ASAP requests.

This calculation can be executed:
- As a simulation during the sales process
- At order entry
- At firm plan
- At factory complete
- At ready for distribution
- At other trigging points

**Transporters can plan their routes already at delivery promise**

- Land transporters can always get the expected transport requirements already from the moment A4D calculates a delivery promise/ETA up to the pickup location

- The information is available on the Web and/or can be ordered by the transporters as a file directly to his own systems

- The transporters can start the booking either in A4D or order EDI-files to the own system and return the confirmed vehicles to A4D. Vehicles are available for booking normally at the same time as they are physically in place

- Sea transporters: All bookings and confirmations are done on A4D’s market place for Vessels
**Dispatch function is designed for trailer transports**
- Complete functionality
  - Capacity Planning
  - Transport Booking/Confirmation
  - Lot/Shipment Formation
  - Picking Lists
  - Documents
- These functions can be done partly or fully in your own systems and communicated to A4D using established EDI-messages
- A4D can send pre-notifications to goods receivers

**Parking/Yard Management is an integrated module in A4D Functions**
- Search for vehicles, parking spaces, booked vessels etc
- Stock maintenance program
- Parameter settings for optimisation
  - Simple yard
  - Advanced yard
- Reports
  - Summaries
  - Stock inventory
  - Used and available capacity

**Statuses for Embedded Process Management can be received directly in A4D**
- When other processes (e.g. PDI, extra equipment, CVS) are embedded in the Distribution Process, it is necessary to receive statuses also for these to have a correct plan/ETA.
- The reporting can be done directly in A4D or via files.
- Different search possibilities are available online.

**A4D can track and trace occurrences in real-time**
- The user can use code “Location, Country, Transporter, Dealer, IP, Factory, Main Type” to search the information in real-time.

**All necessary transport documents and Address Labels are issued by A4D**
- All necessary transport documents are issued by A4D, e.g. CMR, ED, B/L.
- Each vehicle has its own address label issued by A4D including the distribution plan and bar codes for enabling data capturing via scanners.
- A4D creates and sends all necessary customs information to:
  - National customs system inside and outside EU
  - Overseas shipping companies
  - Ports
  - Transporters
  - Factories
Empirical Data

Hold, Distribution Order - Search
- A search can be made by the code ‘administrative’, ‘dealer’, ‘launch’, ‘market’, ‘quality’ or ‘transport’.

A4D’s follow up module enables continuous improvements
- Operational Data Warehouse
  - Real-time query database for special queries and reports not covered by A4D
- Data warehouse emphasizing on Management reporting:
  - Delivery precision
  - Lead-time
  - Quality

The respondents states that A4D focuses on the Distribution Process, but supports the entire Sales to Delivery process. Depending on customers’ needs, three levels of A4D can be implemented, see Figure 4.7

![Figure 4.7 Three levels of A4D System](SOURCE: Volvo Logistics Corporation)

The overview of e-Logistics information system can be seen in Figure 4.8

![Figure 4.8 The e-Logistics Information System, Overview](SOURCE: Volvo Logistics Corporation)
The respondents state that by using the e-Logistics system, they reduce inventory and transportation costs, improve operational efficiencies, and ensure just-in-time (JIT) deliveries. The respondents also state that e-Logistics services is creating customer value from concerning about collaboratively and on-line managing the entire logistics process from time an order is placed to warehousing, inventory management, order fulfillment, shipping and delivery, transactions, and customer care. They also state that, the working capital does not have a significant reduction since the working order fills and invoice accuracy always keep a very high level. The reduction of fixed assets is continuing after the JIT production and JIT delivery have been adopted, the inventory was controlled in a low level. The respondents emphasis that the reduction of administration costs is significant by using the e-Logistics system, because the information is real-time and it collected for the decision making process.

As the respondents stated, the controlled turnover and the revenue is increasing, the increasing of turnover can be seen in Figure 4.9

![Figure 4.9](image1.png)

**Figure 4.9** The Controlled turnover from 2000 to 2004, Overview

**SOURCE:** Volvo Logistics Corporation

At the same time the customer cost savings is also increasing shows in Figure 4.10

![Figure 4.10](image2.png)

**Figure 4.10** The Customer Cost Savings from 2002 to 2004, Overview

**SOURCE:** Volvo Logistics Corporation
Empirical Data

The respondents state that they consider the place utility is not increased so much because the place precision of transportation is always keeping in a high level. They also state that the lead time has reduced significant by using ATLAS and the transportation time is reducing after the JIT delivery system has been adopted.

And also transport time precision is very high at the year 2004 compared with the year 2003, as the respondents states. Shows in Figure 4.11

<table>
<thead>
<tr>
<th>Transport precision 2003</th>
<th>Outbound target</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Inbound target</strong></td>
<td><strong>Outbound target:</strong></td>
</tr>
<tr>
<td>Volvo Group: 98% (day)</td>
<td>With A4D: 98%</td>
</tr>
<tr>
<td>Volvo Cars: 98% (hour)</td>
<td>Without A4D 95%</td>
</tr>
<tr>
<td><strong>Inbound Achievement</strong></td>
<td><strong>Outbound Achievement</strong></td>
</tr>
<tr>
<td>VLSD: 95% on time</td>
<td>VLSD: 80% on time</td>
</tr>
<tr>
<td>VLE: 92% on time</td>
<td>VLE: 85% on time</td>
</tr>
<tr>
<td>VLNA: 97% on time</td>
<td>VLNA: 90% on time</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Transport precision 2004</th>
<th>Outbound target</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Inbound target</strong></td>
<td><strong>Outbound target:</strong></td>
</tr>
<tr>
<td>Customer: 95% (Day or hour)</td>
<td>95% (Day)</td>
</tr>
<tr>
<td><strong>Inbound Achievement</strong></td>
<td><strong>Outbound Achievement</strong></td>
</tr>
<tr>
<td>VLSD: 96% on time</td>
<td>VLSD: 83% on time</td>
</tr>
<tr>
<td>VLE: 95% on time</td>
<td>VLE: 85% on time</td>
</tr>
<tr>
<td>VLNA: 97% on time</td>
<td>VLNA: 95% on time</td>
</tr>
</tbody>
</table>

Figure 4.11 The Transport Precision, 2003 and 2004

SOURCE: Volvo Logistics Corporation

The respondent state that with the V-EMS, they can have total control of packaging balance on hand and costs for all users, improved empty packaging order management with analysis and planning, a flexible independent control system, reduced operating costs by minimizing the total empty packaging stock, reduced administration and transportation costs, detailed empty packaging status information at depots, inventory and stock reporting functions, and improved information quality and follow-up metrics.

The respondent also state that the cost is saving from the following aspects: transport cost by the new route planning system and the help of GPS; packaging cost, HUB/Warehousing cost, logistics services cost e.g. repacking, labeling and etc and purchasing cost by the new planning system, cost for expedite and rush transport by the transport planning system, cost for consequences if production disturbances by the inventory management system,
4.1.2 RQ2: How can the factors that influence the e-Logistics system be described?

The respondents state the factors that influence their e-Logistics system as following:

**Reliability factors**

The factors of reliability and cost were rated at medium to high. It’s important that cost is not the primary driver for them. The company may not choose the cheapest alternative, if the key factors of security and convenience are not met. Reliability also is a leading factor and relates to the strategic importance of logistics, verified by both respondents. Options that must be considered and implemented to enhance VLC system reliability include:

- Derating (defined as purposeful over-design to allow a safety margin)
- Redundancy and Ease of reconfiguration

Reliability also affects the costs to own and operate a system. The cost of ownership includes gas and oil, insurance, repairs, and replacement of tires and other expendables. Reliability determines how often repairs are needed. The less often the car has a failure, the less it will cost to operate over its life. The reliability of any repairable system is a significant factor in determining the long-term costs to operate and support the system.

**Maintainability factors**

The number of work hours personnel will spend on maintenance is typically estimated based on some maintainability and repair measure such as mean time to critical maintenance. The result is then multiplied by the average hours spent repairing or maintaining the equipment. A personnel cost factor which captures pay and benefits is then applied to the estimated personnel hours. This is a typical method for estimating direct personnel costs.

The measure of the ability of an item to be retained in, or restored to, a specified condition when maintenance is performed by personnel having specified skill levels, using prescribed procedures and resources, at each prescribed level of maintenance and repair. Together, reliability and maintainability information form the basis for determining recurring labor and material costs associated with maintenance and supply. Maintenance can be said to be economical of (staff) resources to the extent that the maintenance effort is minimized for a given level of accomplishment. Every information system is further associated with a variety of maintainability conditions which makes this more or less possible. Among these conditions are: (1) compatibility, the extent to which the system employs institutionalized data and technology; (2) integrity, the extent to which the system provides for reliable, error-free processing; (3) simplicity, the extent to which the system invokes relatively few, straightforward procedures; (4) usability, the extent to which the system offers convenience and functionality well suited to the organizational task; (5) extensibility, the extent to which the system may be extended to meet new requirements and needs; (6) stability, the extent to which the system can accommodate environmental change and adaptive interventions; and (7) familiarity, the extent to which the system is known by the people who work with it. The assessment of these conditions for any information system helps to establish its current inherent maintainability. Table 4.1 elaborates briefly by means of examples.
### Table 4.1 Indicators of information-system Maintainability

<table>
<thead>
<tr>
<th>Maintainability Conditions</th>
<th>Maintainability Indicator in Development</th>
<th>Maintainability Indicator in Operation</th>
<th>Maintainability Indicator in Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compatibility</td>
<td>Current development methods and tools are employed</td>
<td>Standard platform technology is used</td>
<td>Broadly-accepted user interface is employed</td>
</tr>
<tr>
<td>Usability</td>
<td>User requests for new functionality are well motivated and informed</td>
<td>User requests for operational assistance are minimal</td>
<td>Users employ few “workarounds” to accomplish tasks</td>
</tr>
<tr>
<td>Extensibility</td>
<td>New modules require few changes to existing modules</td>
<td>Platform supports expanded scale of processing</td>
<td>System functionality can be leveraged in new uses</td>
</tr>
<tr>
<td>Stability</td>
<td>Software may be modified without introducing new faults</td>
<td>Operator interventions do not bring system down</td>
<td>New peak periods of use do not result in system failures</td>
</tr>
<tr>
<td>Familiarity</td>
<td>Software maintainers have been with system from the beginning</td>
<td>Operators have long experience with system</td>
<td>Users have substantial system-specific training and experience</td>
</tr>
<tr>
<td>Simplicity</td>
<td>Software is structured and modularized</td>
<td>Processing requires minimal operator intervention</td>
<td>Required user routines and skills are easily learned</td>
</tr>
</tbody>
</table>

**Supply support factors**

VLC provides higher levels of supply support for bases outside Sweden. These bases achieve higher levels of support because they use higher safety levels.

**Test and support equipment factors**

VLC performs sensitivity analysis both on operating environment parameters that designed at the planning phase and for unexpected situations. Possible defections of scenario can be detected by analyzing the change of operating environment that might cause the change of final decision. In this case, computer simulation plays an important role. For instance, during simulation process, if a crane that is used for automatic transportation for storage is out of function, the effect on the overall operating task can be simulated and analyzed on computers by simply change relevant parameters. Such simulation is necessary for important automatization projects, and it is relative easy to perform it on computers.
Organizational factors
With the rapid development of Information Technology, VLC effectively integrate logistics processes through the usage of electronic networks. In such organization architecture, VLC, depending on needs, creates virtual logistics organization (informal logistics organization) that cannot be seen in a formal organization architecture. After performing its logistics processes, such virtual logistics organization is dismissed.

Facility, transportation, and handling factors
Factors that influence transport demand, costs, market structures, carrier pricing, and carrier operating and service characteristics and their influence on other supply chain costs and supply chain performance. As one of the most crucial supply chain processes, accounting for 60% of total logistics costs, transportation has to support business generated electronically. Transportation has a significant influence on the speed and reliability of the order cycle and the quality of the customer experience. As critical supply chain members, transportation suppliers must be able to function as partners, to produce, share and manage information and to provide higher levels of service in terms of speed and reliability. They have to be able to trace and track shipments under their control and make the information readily accessible to customers or supply chain partners. They can provide real-time information in a customized way, and become an integral part of customers' supply chains, creating the opportunity to secure long-term business by embedding their processes in those of their customers and adding value beyond traditional transportation and logistics offerings.

Information technology and the Internet have revolutionized the way company does business. They have changed the way organizations operate by enabling the re-engineering of sourcing, production and logistics processes.

e-logistics and the Internet have begun to influence the demand for transport, the means by which transport is produced, and the market structure of transport:
E-logistics can diminish or transform the demand for transport by 'dematerializing' physical products (reducing their size and weight or shifting them from actual to digital products).  
e-logistics improves supply chain management and create new distribution patterns through on-line selling — influencing transport services with respect to what, how much, when and where they are required.

They also use e-technology to improve internal business processes, customer relationship management, procurement, and supply chain co-ordination. The Internet enables the growth of market exchanges or electronic marketplaces that provide a new medium for shippers to buy and carriers to sell transportation.

As one of the most crucial supply chain processes, accounting for 60% of total logistics costs, transportation has to support business generated electronically. Transportation has a significant influence on the speed and reliability of the order cycle and the quality of the customer experience. As critical supply chain members, transportation suppliers must be able to function as partners, to produce, share and manage information and to provide higher levels of service in terms of speed and reliability. They can trace and track shipments under their control and make the information readily accessible to customers or supply chain partners. When transportation can provide real-time information in a
customized way, they can become an integral part of their customers’ supply chains, creating the opportunity to secure long-term business by embedding their processes in those of their customers and adding value beyond traditional transportation and logistics offerings.

The respondents state that e-Logistics Applications in Transportation are important.

Geographic Information System (GIS) is used to define vehicle road model, shortest distance model, network logistics model, infrastructure positioning model. Radio Frequency (RF) is used in situations where data collection and exchange are needed such as tracing material, transportation tool and stack identification.

The respondents state that high levels of satisfaction with the ability to perform transactions over the Internet. Satisfaction was higher for intermodal service, which is the more competitive arena. Railroad performance in meeting shipper expectations about Internet readiness improved substantially from 1995, with more than 60% of shippers indicating that they were more satisfied in 2000 than in 1995.

At the same time, wider use of e-Logistics in the rail sector faces several barriers:

- Insufficient customer and supplier readiness or attachment to legacy systems, reducing the seamlessness of information throughout the supply chain.

- Gaps in the supply chain — where a carrier or carriers are not using the Internet — create ‘black holes’ in shipment information.

- Standardized procedures and data formats increase shippers' ability to move from one railway to another, increasing competitive pressure on individual railways, so companies will have to decide, individually and collectively, what industry-wide applications should be created. A reasonable criterion might be to adopt standards that increase rail competitiveness for intermodal traffic. Without this, the capacity to co-ordinate across railways and offer shippers seamless service will be compromised, especially in intermodal markets.

- Collaboration between railways remains foreign to the culture of many companies, especially where potentially sensitive commercial data are involved.

The respondents of VLC consider that transportation is one of the most important factors. Transportation Factors:

1. **Mode Choice.** Slower modes yield excess in-transit inventory. Less reliable modes yield higher safety stocks.
2. **Delivery/pick-up frequency.** More frequent shipments reduces cycle stock inventory.
3. **Routing.** Favorable routes and schedules reduce in-transit stocks.
4. **Tracking.** Inventory visibility breeds trust which reduces just-in-case inventory.
5. **Carrier choice.** Reliable carriers show up on time and reduce the need for safety stock.
Empirical Data

Speed: VLC delivers efficient logistics through prompt transportation, efficient beforehand- and underway management. It is the basic requirement in the supply chain management and is also the basis for ensuring a high efficiency supply chain.

Dynamic: they share information and gets knowledge support through dynamic computer network to enable enterprises to communicate, corporate and therefore form a supply chain. VLC and management is also formed during the form of the supply chain, and vice versa. In the mean time, the dynamic behavior can normally been seen at the three logistics processes such as beforehand management, underway management, and afterwards management.

Diversity: in the supply chain management, diversity can be divided by the diversity of logistics styles and logistics articles. Due to the diversity of transportation tools, logistics processes are normally taken by using different types of transportation. It is not a single type of articles that are in different phases of supply chain, instead, they are diverse – different models of the same product series in the same enterprise, different products of different enterprises, and similar products of different enterprises.

Customized: logistics delivers adaptive solutions and reliable product quality to customers according to their needs. Logistics therefore needs scientific management while, in the mean time, adapts the changes of customers’ needs.

Green logistics is a main direction in the logistics management in the 21st century. It reduces the negative impact to the environment while, in the mean time, maximizes the usage of logistics resources. VLC achieves this by efficient use of transportation resources, increasing distribution efficiency and stowage rate, and complying with EU emission legislation.

Software factors

The respondents states that the characteristics of modern logistics include globalization, informationization, use of computer network, intelligentization, flexibilization, environmental care, and integration. Among them, globalization and informationization are of the most important. For instance, informationization traces the articles and manages logistics in different spaces by using EAN logistics label, EDI (Electronic Data Interchange) GIS and GPS. They use POS system (Point of Sales) EOS system(Electronic Ordering System) and OCR(Optical Character Reader) to realize informationization of logistics system.

Respondents of VLC state that logistics is an area where Internet is often used, they put a special focus on it. Most often used and offered for logistics purposes is order status information system, followed by information service. The replies to other questions also indicate that the Internet is still more popular as a passive information system, used to gather information from different databases on the Internet, than as a bi-directional information transfer system to connect different information system and thus help to support processes. Most popular application to support processes is electronic order placement. Higher sophisticated applications that include logistics activities like dispatching the acquired products or Internet-based software for the tendering process are not used as frequently.
Empirical Data

The software provider company put a high emphasis on productivity. They use e-technology to improve internal business processes, customer relationship management, procurement and supply chain co-ordination. They use e-Logistics and related technologies to meet service requirements:

- To participate in supply chains that achieve the benefits offered by e-Logistics, carriers need new capabilities with respect to information technology. The ability to provide and share information on shipment and equipment visibility in real time to many supply chain partners is becoming more important; for many shippers it is a basic criterion in selecting carriers.

- To participate in Internet-based supply chains, carriers must be web-enabled as well, so they can share information and perform transactions such as selling their services on-line and providing shipment status information.

Availability factors
VLC offer reductions for facility and equipment installation and rearrangement. They are dealing with inherent availability when only reliability and corrective maintenance or repair (i.e. design) effects are considered.

Economic factors, and Effectiveness factors
Logistics personnel costs include the costs of personnel involved in logistics support, procurement, inventory management, technical data support, and the shipping and handling costs for sending items from the organizational level to the depot and back.

4.2 Case Two: Haier Logistics Corporation (HLC)

The Haier Group

Haier was incorporated in 1984 producing household refrigerators and, over the past 18 years, has grown and prospered as a multinational company widely recognized in the world community. Haier now manufactures a wide range of household electrical appliances in 86 categories with 13,000 specifications and exports products to more than 160 countries. Haier’s global sales in 2002 were totaled CNY 72.3 billion, including overseas turnover of USD1 billion.

Haier’s international promotion framework encompasses globalized trading, design, production, distribution and after-sales service networks. Haier now has established 18 design institutes, 10 industrial complexes (1 in USA, 1 in Pakistan, 5 in Qingdao, China, 1 in Hefei, China, 1 in Dalian, China and 1 in Wuhan, China), 13 overseas production factories, 58,800 sales agents and 11,976 after-sales services throughout the world. Haier’s current domestic market share for refrigerators, freezers, air-conditioners and washing machines is about 30%, respectively. Haier products are marketed to 12 of 15 European and 9 of 10 American top chain supermarkets using local facilities and labor forces for design, production and sales in the United States and some European countries.

On March 4, 2002, Haier unveiled its American headquarters in the landmark neoclassical building, the former office of the Greenwich Savings Bank, on Broadway in Manhattan, New York, indicating that Haier had moved in a new phase for globalization.
of product design, manufacture and sales with a strong determination in long-term development in the United States.

Haier is now widely recognized in the world. From the latest statistics of Euro-monitor, Haier was placed fifth of the global white goods manufacturers with the largest world market share for refrigerators. In the list of the most respected companies in Asia and Pacific Region published by the Far Eastern Economic Review issue December 26, 2002, Haier was placed first. On December 7, 1999, Haier CEO Zhang Ruimin was placed 26th on the list the world’s 30 most respected entrepreneurs published by the Finance Times.

Facing challenges from E-commerce and China’s accession to WTO, Haier started in 1998 the management restructuring program backed by efficient Haier market-chain system and order process performance, focusing on improvement of information efficiency for contract execution, logistics service, capital investment, after-sales services, inventory and operation cost reduction. Haier’s production and management system restructuring has enabled Haier to diversify internal and external resources. At present, Haier has put its worldwide logistics, distribution and manufacture facilities into efficient operation for customer demand satisfaction. In 2002, Haier made achievements in the sectors of home integrations, telecom, software and financial services.

Haier’s management philosophy and corporate culture are praised and researched by overseas scholars. Haier’s achievements and experiences have been taken into archives and used as MBA teaching programs by Harvard University, European Business College and Lausanne Management College.

Haier development theme features “Creativity, Speed and SBU”. Haier’s 30,000 employees are striving to reach the target set forth in Haier’s SBU Program. Haier’s goal is to obtain worldwide recognition and to become one of Fortune Global 500.

**Haier Logistics Corporation**

Haier Logistics Corporation (HLC) is a sister company within the Haier Group, the company develops and provides transport and logistics solutions for the Haier Group as a whole and also has some external customers from all over the world, such as such as Nestlé, AFP, HP and etc. The structure of HLC can be seen at Figure 4.12.
The Haier logistics inherited the unique enterprise culture and the management system as well as the management innovation ability from the Haier group. And they developed their strategy as taking the customer as the center in order to enables Haier logistics to make the rapid response to customer, to help the customer to win competitive advantage based on the time aspect. With the enterprise culture of speed, innovation, and SBU, the HLC can not only seek the best logistics solution for their customer but also can control entire logistics system by the unique market chain system and the quantitative KPI benchmark management.

HLC works for 7 big production bases of Haier group, they have 42 local delivery centers, more than 3,000,000 storehouse space and more than 300 transportation corporations, the entire network system is linked by SAP R/3 ERP and SAP LES. The network covers 1,500 service centers, 1,000 sell centers and more than 16,000 vehicles, the promises of logistics service is: the request of national lines delivers in 2 days, the request of key city, 8 hours to deliver and the request of region delivers in 24 hours.

4.2.1 RQ1: How can the e-Logistics system be described?

The Process of e-Logistics
The respondents state that they are currently using e-Logistics system. There are five steps when they establish the e-Logistics system.

Step 1 Framework Construction
In this step, HLC critically examined the current situation, analyzed the pros and cons of the e-Logistics process, and brainstormed innovative methods in which to implement the new process.

Step 2 Function integration
This step mainly emphasizes the steps taken to achieve customer satisfaction and related criteria. Here HLC adopted Material Requirements Planning (MRP), a very efficient tool
Empirical Data

and technology to forecast and control customer’s needs to plan and control. Without the forecasts, distribution and manufacturing’s efficiencies would be crippled. Currently, the e-Logistics system integrates all the information to quicken the response in manufacturing and distribution.

Step 3 Internal supply chain integration
In this step, HLC first integrated the existing internal activities directly controlled by the corporation, done by an information network between departments. The output of this integration resulted in better planning and more efficient control. To support this integrated system, HLC employed Supply Chain Planning (SCP) and ERP. The base of these two kinds of information technologies is a Client/Server system. Effective SCP integrated all the daily operation functions, including customer demand forecasts, resource allocations, equipment management, production schedules, and purchasing plans. ERP systems integrated those executive functions in operation flow, such as orders management, financial management, stock planning and production management.

The goal of supply chain management is consistent with the corporation’s goal, which is to attain total customer satisfaction. The e-Logistics system allows the delivery of the products to the customer at the most competitive prices.

In this step, HLC also used Electronic Data Interchange (EDI) and the Internet to foster better relation with suppliers. EDI has been considered a useful component of inter-organizational information systems. One of the benefits of implementing EDI inter-organizationally is to provide opportunities for HLC’s partners to better communicate, which in return benefits HLC and all parties involved. These benefits include higher levels of operational efficiency, lower distribution time, and improved customer service.

Step 4 External supply chain integration
In this step, HLC stressed establishing partnerships with external suppliers. HLC augmented communication with its suppliers, sharing useful information with them. By using Vendor Managed Inventory (VMI), both Haier Group and its suppliers are aware of inventory levels through shared information on the Internet. Now the suppliers have a better estimate of how many inventories Haier will need, reducing inventory costs for the suppliers. At the same time, it ensures the flow of raw material to Haier, which eliminates the down time related to lack of material supply, offering a win-win situation for both Haier and its suppliers.

Step 5 Dynamic alliance of integrated supply chain
In this step, all the parties in the supply chains become a rapid response organization. When orders were received by Haier, all the suppliers worked together to support the flow of raw materials. Not to mention, this kind of quick communication can only be accomplished by an effective information network, such as Internet or Intranet.

After the e-Logistics system established, the whole e-Logistics system can be seen in Figure 4.13
The respondents describe their e-Logistics process as following: when the order is placed, the HLC information center sends a RFQ to the factory, when the manufacture was finished, the HLC label the products and issue a tracking number to customer, the customer can track the shipping on the Internet, when then shipment is finished, the evaluation process is starting, all parties need evaluate the process in order to implement continuous improvement.

The HLC’s e-Logistics Information System can be seen in Figure 4.14, Planning and Collaboration is based on the demand information which comes from the customer’s demand. The whole manufacture activities should be run under the information of customer’s demand. And in the every step of process, the report must be submit to the system for continuous improvement.
Figure 4.14 The HLC’s e-Logistics Information System

SOURCE: HLC internal material

The respondents states that they use mySAP SCM in their HLES-WMS (Haier Logistics Execution System) as their e-Logistics information system. The structure of mySAP SCM1 can be seen in Figure 4.15.
The Value
With the help of HLC, Haier group experienced tremendous growth during past years, it can be described as follows:

- Revenue: 3.48 million RMB ($421 thousands) in 1984; while it was 40.6 billion RMB ($4.9 billion) in 2000, 68.8 billion RMB ($8.32 billion) in 2001, and 102 billion RMB ($12.53 billion)

- Tax: 14.7 million RMB loss in 1984; while it was 3 billion RMB profitable ($363 million) in 2000, and 4.7 billion RMB profitable ($0.53 billion) in 2005

- The price of Haier’s trademark: 3.85 billion RMB ($466 million) in 1995; while it was 30 billion RMB ($3.63 billion) in 2000 and now it was 50 billion RMB ($6.3 billion) in 2005

- The category of Haier’s products: only one type of refrigerator in 1995; now it has more than 10 800 types of products in 69 categories

- The revenue for export: since 1998, the revenue from export has increased sharply. It reached 2.95 billion RMB ($356 million) in 2001 and become the No. 1
Empirical Data

in the electrical appliance industry in China and now it increased to 5.2 billion RMB ($0.65 billion) in 2005.

The respondents state that through JIT (Just in Time) purchase, JIT delivery and JIT distribution, the goal of zero overstock can be met. The figures listed below can demonstrate the value brought about by the e-Logistics system: the cost of the finished products in Haier accounted for 7.9% of the sales income in 2004, whereas the national average was 30% for the 180 thousands domestic enterprises; the logistic management cost in Haier accounted for 7.0% of the total commodity cost, whereas the cost in other enterprises was 15%.

The respondents also state that HLC consider the place utility is so important but it’s not the value created by e-Logistics system, HLC realizes their goal as zero stock, zero delivery capital, and zero distance with customers.

The mission of "zero stock" logistics is to eliminate distance with time and stock volume with time efficiency. HLC’s goal is to eliminate all stock in warehouse. If warehouse is likened to a reservoir, HLC will change the reservoir into a flowing river by the JIT tool as following:

- **JIT purchase**: Purchase is precisely arranged according to the actual needs; needed parts and raw materials are procured through worldwide suppliers for order fulfillment.

- **JIT supply chain**: HLC’s warehouse is just a transit station in which all materials can only be stored for 7 days at most. In HLC automated high-bay warehouses, parts and components will be allowed for 3 days.

- **JIT delivery**: HLC has established a nationwide logistics system for product delivery to every corner in the country.

"Zero working capital" is believed to be the capability to change cash into material objects and then convert material objects into cash. Zero working capital means no fund is used as floating capital. Before making the payment to sub-suppliers, Haier receives payment from buyers. This can be realized as production is scheduled at request of customers. This will result in healthy operation of the enterprise.

Zero distance is important for Haier to acquire orders. Haier strives to shorten or even eliminate the distance to buyers to obtain and satisfy individual orders. If the distance is not eliminated, Haier might not easily know what customers need and how to satisfy their demands. Under "zero distance", Haier will, immediately after obtaining the purchase order, take every effort to satisfy the needs of customers. In the process, delivery efficiency plays a significant role to shorten the time with space efficiency. Buyers can place orders at the Internet and Haier will deliver the ordered goods to the buyers. In past five years with the goal “zero distance” with global customers and quicker information value, Haier received 250,000 pieces of customer information, offering individualized design, an increase in customers to 2,180,000, and an increase in the e-Logistics turnover rate to more than 100%.
4.2.2 RQ2: How can the factors that influence the e-Logistics system be described?

The respondents state the factors that influence their e-Logistics system as following:

**Reliability factors**
The respondents of HLC state that service reliability is often an important decision to consider. They look to set up new production facilities in foreign, unfamiliar territory would have already established a strong business case on cost savings through cheaper land, labor, raw materials and other production factors. They are looking for service quality and reliability and often not in a position to risk production operations in search of 10-20% savings on items that constitute only 10-20% of their cost structure.

Price always plays a role in HLC business decision, but quality comes first for new investors with considerable adversity to the logistics risks associated with an inland location. Once relationships are established, further price breaks can follow through the realization of scale and scope economies.

Operating objectives of internal logistics process includes rapid response, minimum inventory, centralized transportation, minimum variance, quality, and life cycle support. HLC managers pay more attention on inventory control to minimize inventory on a lowest possible level, so called just-in-time inventory.

**Maintainability factors**
Intrinsic factors contributing to maintainability are:

- **Modularity**: Packaging of components such that they can be repaired via ‘remove and replace’ action vs. on-board repair.
- **Interoperability**: Be compatible with standard interface protocols to facilitate rapid repair and component enhancement using common interfaces. Physical interfaces can be designed such that mating between components can only happen correctly.
- **Diagnostics**: Applicable and effective on-board monitoring devices and software, that provide enhanced capability for fault detection and isolation.
- **Prognostics**: Applicable and effective on-board monitoring devices and software, that monitor various components and indicate out of range conditions, imminent failure probability.

**Supply support factors**
HLC takes great efforts to maintain their supply system to provide data and interface for spares acquisition. They carefully make planning process attempting to ensure that the right items, in the right quantities, are at the right places, at the right times, at the most economical cost. Supply support factor is vital to achieving system operational goals since the lack of a single critical spare component part can render the entire system inoperable.

**Test and support equipment factors**
HLC has less emphasized issues in terms of test and support equipment factors.
Organizational factors
Efficient communication between organizations
Network-assisted harmonization
Flat architecture
Flexible, autonomic, and distributed cooperative organization activity
Organization unit: team and team network
Clearly stated responsibility
Team members: adaptation and generalist
Simplified management
Wide-range management

Facility, transportation, and handling factors
The respondents of HLC consider that transportation is one of the most important factors. Transportation Factors:
2. Delivery/pick-up frequency. More frequent shipments reduces cycle stock inventory.
4. Tracking. Inventory visibility breeds trust which reduces just-in-case inventory.
5. Carrier choice. Reliable carriers show up on time and reduce the need for safety stock.

They use Geographic Information System (GIS) to define vehicle road model, shortest distance model, network logistics model, infrastructure positioning model. Radio Frequency (RF) is used in situations where data collection and exchange are needed such as tracing material, transportation tool and stack identification.

To meet the demands of e-business and global logistics, they meet new service requirements such as e-procurement result in greater consolidation by shippers, while supply chain process improvements allow better planning. This results in fewer rush shipments and more larger shipments. Transportation inputs substituted for inventory inputs in the logistics system by using faster and more reliable transport (to reduce contingency stocks) or more long-distance transport (to centralize inventory and reduce stock).

The following sectors are applications in transportation in HLC

Marine Sector
The marine sector — shipping lines, ports, service providers at ports, and connecting surface or air transportation providers — believe that e-Logistics will be critical in their current and/or future success, but actual adoption of e-Logistics systems is spotty. To date, the main use by marine carriers is in tracking and tracing cargo, although electronic document exchange with ports and customs is increasing.

The following sectors are applications in transportation

The respondents stated that about 15% of shippers using marine transport also use e-Logistics to deal with marine carriers. Most of these shippers (68%) are satisfied with their ability to conduct transactions with carriers over the Internet for container traffic, with bulk cargo shippers being slightly less satisfied.
Empirical Data

Ports are often seen as the main focus for expanding e-Logistics in this sector, because they are in the best position to collect and disseminate information used by multiple members of the international supply chain. Instead of making numerous one-to-one contacts, a participant can get all information from a single source. Some ports use the Internet to provide information on vessel tracking, container terminal scheduling, vessel arrival, and turnaround management. Some international carriers, although competing with each other, have established common portals for information on schedules, bookings and related information.

Some of barriers are created or worsened by inadequate participation, co-ordination and collaboration among participants in the marine based supply chain — along with traditional reluctance to rely on partnerships and alliances as a means of business development.

Aviation

Predating e-Logistics and based originally on real-time transactions by telephone, reservation and yield management systems are now being made faster and cheaper by the Internet. On-line air travel portals are developing rapidly and reducing carrier and user costs.

Air transportation applications of e-Logistics include

- B2C transfer of schedules, fares and other service information, as well as on-line reservations, sales and ticketing;
- B2C marketing, including distribution of general promotional information and advisory notices of special offerings, which have become important tools in yield management;
- B2B transactions for interlining, network and schedule co-ordination (including managing alliances);
- carrier-to-airport exchanges for co-ordination, management of airport operations and billing; and
- B2B dealings for airline procurement of supplies and services.

In the air cargo sector, the results showed that among those using air freight services, 24% used e-Logistics. Carriers, through their world association, are already implementing a paperless air waybill initiative. Involving several international carriers and scheduled for completion, the initiative is expected to clear the way for using electronic waybills throughout the industry. This is expected to speed up data transmission and significantly reduce the possibility of errors, lowering costs for both carriers and freight forwarders. Concern remains, however, about the lack of international agreement on standards.

Trucking

The respondents of HLC state clear consensus on the importance of e-Logistics in maintaining a competitive edge. For motor carriers, the benefits lie in greater efficiency and customer satisfaction. E-Logistics applications in this mode may be of particular
Empirical Data

Benefit in improving equipment utilization and reducing empty running through better matching of carrier supply and demand.

The overwhelming majority are using some form of information technology in business operations, including equipment and load management through improved communications. In addition, satellite-assisted navigation and communication are becoming increasingly valuable in monitoring the status and location of shipments and equipment. But they less use the Internet to its full potential. In most cases, the barrier appears to be customer readiness, with cost as the second most significant obstacle. Some carriers also cite information security issues, technology limitations, and lack of internal expertise.

In short, HLC appear to be testing the waters on an individual basis, investing where near-term benefits appear possible. The cautious approach reflects the nature of the trucking industry — fragmented, fiercely competitive and operating on very low margins. The e-Logistics revolution in this industry will be slow but could accelerate as customers retool to take advantage of carriers' expanding e-Logistics capabilities.

Freight Forwarding

Freight forwarders and other logistics providers are increasing their presence in the supply chain. As intermediaries they have to integrate their activities with those of both shippers and carriers and thus need accurate, real-time information and instantaneous communication and information sharing with both parties.

Forwarders use e-Logistics for shipping schedules, rate information, on-line booking systems, cargo tracking, electronic payment, and bill of lading exchange. Additional internal uses include carrier performance records, documentation storage and retrieval, and pick-up/delivery information.

Barriers to implementation are similar to those in other sectors: cost, a fragmented industry, partner compliance and a traditional reliance on paper transactions.

Railways

VLC railways acknowledge the importance of e-Logistics, but they also recognize that their main priority is to increase service reliability and speed.

They have generally developed e-Logistics applications internally and is often the first to market with e-Logistics innovations in the rail industry. CPR has generally adopted best-of-breed applications developed by other railways and proponents of marketplace and industry solutions. Both carriers appear well poised to take advantage of e-procurement and to participate in electronic marketplaces or exchanges as they become more common.

Regional railways generally lack the resources to pursue e-Logistics opportunities internally. They seek to leverage industry initiatives where possible or focus their efforts on a few initiatives customized to their situation. The short lines have the fewest resources and least capacity to adopt a cohesive e-Logistics strategy and have minimal Internet capabilities.
Empirical Data

The respondents state that high levels of satisfaction with the ability to perform transactions over the Internet. Satisfaction was higher for intermodal service, which is the more competitive arena. Railroad performance in meeting shipper expectations about Internet readiness improved substantially from 1997, with more than 60% of shippers indicating that they were more satisfied in 2004 than in 1997.

At the same time, wider use of e-Logistics in the rail sector faces several barriers:

- Insufficient customer and supplier readiness or attachment to legacy systems, reducing the seamlessness of information throughout the supply chain.
- Gaps in the supply chain — where a carrier or carriers are not using the Internet — create 'black holes' in shipment information.
- Standardized procedures and data formats increase shippers' ability to move from one railway to another, increasing competitive pressure on individual railways, so companies will have to decide, individually and collectively, what industry-wide applications should be created. A reasonable criterion might be to adopt standards that increase rail competitiveness for intermodal traffic. Without this, the capacity to co-ordinate across railways and offer shippers seamless service will be compromised, especially in intermodal markets.
- Collaboration between railways remains foreign to the culture of many companies, especially where potentially sensitive commercial data are involved.

Software factors

HLC fully understand the importance of logistics management, take advantage of computer network, well prepare strategic research and planning, and make full use of existing logistics transportation network and tools to promptly deliver dynamic services to customers.

Information technology enables logistics and supply chain managers to meet demands by integrating systems, collaborating within and across corporation, and sharing information throughout the supply chain, enabling supply chain participants to plan and synchronize their processes.

The main problems of logistics environment in China mainland are mainly originated from insufficient hardware infrastructure, which has a negative impact on the development of e-commerce in China.

Availability factors

Effective available capacities are distinguished using an availability factor which is applied in addition to a standard service factor for each process unit.

Logistics distribution enables real-time monitor and real-time decision making in the whole process. Distribution information and resources are sent to all processes via network. The enterprise connects geographically distributed storages via network to be a virtual storage which enables better management and deployment of resources, and enlarged service range. During logistics process, some logistics functions can be virtually presented. In such virtualized processes, high efficient use of articles/materials can be achieved.
**Economic factors, and Effectiveness factors**

HLC management solve problems such as low purchasing costs and deliver on time by using e-system, which are very important to supply chain management of manufacturing enterprises. Solving these problems is the necessary condition for such enterprises to ensure a minimum inventory on production materials and is also the important joint between the enterprises and their suppliers.

Each facility stands as a cost or profit centre where the prices being charged for different activities are covering the direct operating costs and making a contribution to facility cost (both fixed and variable) as well to general overheads. In this regard, it is important that facility costs include not only their own capital (tied in construction) but also the land and site preparation costs shared by other facilities.

Costs of different functions or processes being performed within the facility are accounted for following sound activity-based costing principles. In turn, this practice helps facilitate activity-based pricing which ensures rational cost allocation and recovery.

**Policy factors**

China’s local governments hold great power compared to their US peers and so the lack of a coherent coordination logistics policy is likely to persist. For example, trucks licensed in Beijing can operate in any province of China, but must wait until midnight to make deliveries in Shanghai. Local governments and different local administrations establish multiple toll collections. Besides highway toll stations, the local management also collects other fees under different titles. The transportation time and cost from the north to the south are amplified by frequent tolls and fee collections. The other aspect is information filter on internet.
5 Data Analysis

In this chapter we conduct within-case analysis and compare the empirical data of VLC and HLC with the conceptualized theories and frame of reference, thereafter perform a cross-case analysis where the findings between the two different cases is compared.

5.1 Within Case Analysis of VLC

In the first section, we analyze the empirical data collected from interviews for VLC. The empirical data is compared to the theories presented in the frame of reference in order to discover similarities or dissimilarities. Each research question is analyzed separately.

5.1.1 How can the e-Logistics system be described?

The Process of e-Logistics in VLC

Compared the theories we are reliable on and the empirical data from our two cases, table 5.1 will present a summary of key findings in regards to the process of e-Logistics in VLC.

Table 5.1 The Process of e-Logistics in VLC

<table>
<thead>
<tr>
<th>The Process of e-Logistics</th>
<th>Volvo Logistics Corporation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Request For Quotes (RFQ)</td>
<td>+/-</td>
</tr>
<tr>
<td>Packaging</td>
<td>-/+</td>
</tr>
<tr>
<td>Shipping</td>
<td>+/-</td>
</tr>
<tr>
<td>Tracking</td>
<td>+/+</td>
</tr>
</tbody>
</table>

+/- = It’s in the theory and the company is using it
-/+ = It’s not in the theory and the company is using it

According to Zhang (2001), typical e-Logistics processes include RFQ, Shipping, and Tracking. The RFQ process is done by the business process manager in order to get the basic services such as getting the quotes in an e-Logistics process. As VLC states RFQ is used when they purchase the transport and logistics services, called contracting process. The respondents also state that the shipping management and the tracking management are involved in the whole e-Logistics system. Once goods are shipped, the tracking number is registered on the Internet and then given to customers. The customers can track their shipment with the help of this number, which fits the theory of Zhang (2001), shipping process is coming after the RFQ process, after the goods are shipped, the tracking number is given to the customer and mapped in the system at the same time, the customer can track their shipment by using this number. But VLC also consider packaging process is a main process in e-Logistics system, they call it emballage logistics, with the support of V-EMS (Volvo Emballage Managing System), VLC can minimize customers' costs by optimizing packaging logistics.
The Logistics Information System

Table 5.2 shows the key finding of logistics information system in VLC.

<table>
<thead>
<tr>
<th>Logistics Information System</th>
<th>Volvo Logistics Corporation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planning System</td>
<td>+/+</td>
</tr>
<tr>
<td>Execution System</td>
<td>+/+</td>
</tr>
<tr>
<td>Research and Intelligence System</td>
<td>+/+</td>
</tr>
<tr>
<td>Reports and Outputs System</td>
<td>+/+</td>
</tr>
</tbody>
</table>

+/- = It’s in the theory and the company is using it

According to Coyle (2003), a logistics information system can be divided into four systems, i.e. planning system, execution system, research and intelligence system and reports and outputs system. From the collected data, we see that VLC has a lot of steps in their logistics information system, but all of these steps are in the four main systems.

As Coyle (2003) described, the planning system were referred to as decision support technologies, which related to such needs as network design, demand planning and forecasting, strategic sourcing, production planning and scheduling, and distribution planning. In ATLAS, the planning system includes defining requirements and designing the e-Logistic process while in A4D system, the planning system includes: firstly, calculation of distribution start and end date, it does the plan at the following time points: at order entry, firm plan, factory complete, ready for distribution, and other trigging points. Secondly, transport plan and dispatch plan, it includes: capacity planning, lot/shipment formation, and picking lists and documents.

Logistics Execution System (LES) is used to manage activities in areas such as warehousing, transportation, international trade, and inventory (Coyle, 2003). In ATLAS, the execution system includes implementing

- the web application to support the data collection of transport booking, proof of collection, proof of delivery, pre-arrival notification, and transport status
- system administration functionality and configuration
- and rolling-out of new settlement system, deliver self-billing functionality, and configure
- and rolling-out of new transport execution system which deliver basic cross dock functionality, deliver goods-pre reception functionality, deliver track and trace functionality.

Within the A4D system, the execution system includes: transport booking/confirmation, sending pre-notifications to goods receivers, parking/yard management such as search for vehicles, parking spaces, booked vessels, stock maintenance and etc, real-time track and trace, issue all necessary transport documents and address labels for national customs system inside and outside EU, overseas shipping companies, ports, transporters and factories, and hold, distribution order search system.
The Logistics Research and Intelligence System scan the environment and makes observations and conclusions available throughout the logistics area and the whole firm (Coyle, 2003). By scanning the environment, in ATLAS, the system can harmonize necessary master data, deliver transport planning (including operational optimization) functionality, deliver event management functionality and finish tactical optimization. In A4D system, it includes parameter settings for optimization in parking/yard management part.

The reports and outputs system is the last in the major part of the logistics information system. Report may serve purposes such as planning, operations, and control (Coyle, 2003). In ATLAS, the report system includes: deliver tools and reports to measure supplier and carrier KPIs and deliver reports to measure financial KPIs. In A4D system, the reports part includes: reports of summaries, stock inventory and used and available capacity in parking/yard management part, reports of statues for embedded process management, and reports of warehouse which include delivery precision, lead-time and quality, and the reports of real-time query database for special queries which is not covered by A4D.

**The Value**

Table 5.3 shows the key finding of the value which is created by e-Logistics system in VLC.

**Table 5.3 The Value of e-Logistics System in VLC**

<table>
<thead>
<tr>
<th>The Value of e-Logistics System</th>
<th>Volvo Logistics Corporation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Place Utility</td>
<td>+/-</td>
</tr>
<tr>
<td>Time Utility</td>
<td>+/-</td>
</tr>
<tr>
<td>Revenue</td>
<td>+/-</td>
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<tr>
<td>Operating Costs</td>
<td>+/-</td>
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<tr>
<td>Working Capital</td>
<td>+/-</td>
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<tr>
<td>Fixed Assets</td>
<td>+/-</td>
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<tr>
<td>Administration Costs</td>
<td>+/-</td>
</tr>
<tr>
<td>Customer Cost Savings</td>
<td>+/-</td>
</tr>
</tbody>
</table>

+/+ = It’s in the theory and the company consider it’s important  
-/- = It’s not in the theory and the company consider it’s important  
+//- = It’s in the theory and the company consider it’s not important

There are four principal types of economic utility add value to a product or service. The logistics which influence place utility and time is a very important aspect in value creation. (Coyle, 2003)

Coyle (2003) described place utility as logistics provides place utility by moving goods from the production point to the points where demand exists. The VLC considers the place utility is not increased so much because the place precision of transportation is always kept in a high level. Coyle (2003) described time utility as the goods must be at the point when customers demand them. The e-Logistics system creates time utility for
VLC by reducing the lead time from the use of ATLAS and the transportation time by use of the JIT delivery system, at the same time, by using the A4D system, the transport time precision was increased greatly.

According to Lambert (2000), economic value-added can be affected by e-logistics in four aspects: Revenue, Operating Costs, Working Capital and Fixed Assets. The revenues of VLC was increased accompany with the increase of turnover and the decrease of costs. The operating costs were reduced since reduced inventory and transportation costs, improve operational efficiencies, and ensure just-in-time (JIT) deliveries. In ATLAS, the operating costs are saved from minimizing the total empty packaging stock, reduced administration and transportation costs. The VLC consider the working capital does not have a significant reduction since the working order fills and invoice accuracy always keep a very high level and the reduction of fixed assets is continuing after the JIT production and JIT delivery have been adopted, the inventory was controlled in a low level and the costs for warehouse was reduced. Furthermore, the VLC emphasize that the reduction of administration costs is significant by using the e-Logistics system, because the information is real-time and it collected for the decision making process. In ATLAS, the administration costs are saved from detailed empty packaging status information at depots, inventory and stock reporting functions and improved information quality and follow-up metrics. At the same time, the customer cost savings were increased greatly compared with the year 2002 when the e-Logistic is not fully adopted.

5.1.2 How can the factors that influence the e-Logistics system be described?

Table 5.4 presents a summary of key findings in regards to the factors that influence e-Logistics system in VLC:

<table>
<thead>
<tr>
<th>The Factors</th>
<th>Volvo Logistics Corporation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reliability factor</td>
<td>+/-</td>
</tr>
<tr>
<td>Maintainability factors</td>
<td>+/-</td>
</tr>
<tr>
<td>Supply support factors</td>
<td>+/-</td>
</tr>
<tr>
<td>Test and support equipment factors</td>
<td>+/-</td>
</tr>
<tr>
<td>Organizational factors</td>
<td>+/-</td>
</tr>
<tr>
<td>Facility, transportation and handling factors</td>
<td>+/-</td>
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<tr>
<td>Software factors</td>
<td>+/-</td>
</tr>
<tr>
<td>Availability factors</td>
<td>+/-</td>
</tr>
<tr>
<td>Economic factors</td>
<td>+/-</td>
</tr>
</tbody>
</table>

+/- = It's in the theory and the company is using it

According to Blanchard (1998), one must establish the appropriate logistic support requirements in the early stages of advance planning to ensure that logistics is properly addressed throughout the system life cycle. Increased visibility and the transfer of real-time information bring new effectiveness to supply network management. To fully benefit from emerging e-logistics solutions, trading partners must be able to more easily exchange data between their back-end databases and core business application (Webster,
This must be accomplished within the company as well as within the supply network the enterprise operates in. Some of the more commonly employed quantitative factors applicable in the development and evaluation of a logistic support capability for a system. Of particular significance are reliability and maintainability factors, supply support factors, test and support equipment factors, organizational factors, facility and transportation factors, economic factors (Blanchard, 1998).

Reliability is the probability that an item will perform its intended function for a specified interval in a stated condition (Don Gerstle, 2004). Reliability determines how often repairs are needed. The less often the car has a failure, the less it will cost to operate over its life. The reliability of any repairable system is a significant factor in determining the long-term costs to operate and support the system.

Maintenance activities are typically classified according to increasing level of proactivity: corrective maintenance, preventive maintenance, reliability, predictive maintenance, self-maintenance and tele-maintenance. (LOGTECH, 2002) They state maintainability conditions in aspects of compatibility, integrity, simplicity, usability, extensibility, stability and familiarity.

Respondents of VLC state that reliability factors and maintainability factors are often important in e-logistics system. The respondents were responsible for the development of e-logistics in their company. Information and communication technology have played a key role in transforming logistics and supply chain planning.

Supply support encompasses all management procedures and techniques used to acquire, catalogue, receive, store, transfer, issue and dispose of all secondary items, including provisioning for initial support. (Galloway, 1996) A modern just-in-time inventory system provides supply support with response times in VLC measured in hours, not days or weeks.

The general category of test and support equipment may include a wide spectrum of items. (Blanchard, 1998) VLC performs sensitivity analysis both on operating environment parameters that designed at the planning phase and for unexpected situations. Possible defections of scenario can be detected by analyzing the change of operating environment that might cause the change of final decision, for instance, computer simulation plays an important role.

The influence of maintenance organization is basically the same as those factors which are typical for any organization. (Blanchard, 1998) VLC depends on needs, creates virtual logistics organization (informal logistics organization) that cannot be seen in formal organization architecture. After performing its logistics processes, such virtual logistics organization is dismissed.

In essence, transportation plays a key role in the area of logistics support. It aimed at expanding the production system as a whole and can be considered as strategic activities linking all the operators along the value-chain. (Calza and passaro, 1997) E-logistics and the Internet have begun to influence the demand for transport, the means by which transport is produced, and the market structure of transport. They can provide real-time information in a customized way, and become an integral part of customers' supply chains.
For many systems, software has become a major element of support. This is particularly true where automation, computer applications, digital data bases and the like are used in the accomplishment of maintenance and functions. They use POS system (Point of Sales)、EOS system(Electronic Ordering System) and OCR(Optical Character Reader) to realize informationlization of logistics system. They also use e-technology to improve internal business processes, customer relationship management, procurement and supply chain co-ordination. In other hand, they used to gather information from different databases on the Internet.

According to Blanchard (1998), three commonly used as inherent availability, achieved availability, operational availability. VLC offer reductions for facility and equipment installation and rearrangement.

The recent combination of economic trends, rising inflation, cost growth experienced for systems and products, the continuing reduction in buying power, budget limitations. VLC solve problems such as low purchasing costs and deliver on time by using e-system.

Most factors in theory were used in VLC. They use supply support factors in aspect of traditional physical logistics.

### 5.2  With-in Case Analysis of HLC

In the second section, we analyze the empirical data collected from interviews for HLC. The empirical data is compared to the theories presented in the frame of reference, in order to discover similarities or dissimilarities. Each research question is analyzed separately.

#### 5.2.1 How can the e-Logistics system be described?

The Process of e-Logistics in HLC

Table 5.5 presents a summary of key findings in regards to the process of e-Logistics in HLC:

<table>
<thead>
<tr>
<th>The Process of e-Logistics</th>
<th>Haier Logistics Corporation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Request For Quotes (RFQ)</td>
<td>+/-</td>
</tr>
<tr>
<td>Shipping</td>
<td>+/-</td>
</tr>
<tr>
<td>Tracking</td>
<td>+/-</td>
</tr>
<tr>
<td>Evaluation</td>
<td>-/+</td>
</tr>
</tbody>
</table>

+/- = It’s in the theory and the company is using it  
-/+ = It’s not in the theory and the company is using it

HLC considers there are four main parts in their e-Logistics process, RFQ, Shipping, Tracking and Evaluation, as stated by Zhang (2001). The RFQ process starts when the order is placed and the logistics information center sends a request to factory for
manufacture. After that it is the shipping process which includes Availability Check, Receiving Goods, Warehousing, Logistics Planning, Packaging, and Transportation. During the shipping process the tracking process is involved, customers can track their goods during the whole logistics process. Furthermore, they consider evaluation is not a part in other process; it’s a very important process in e-Logistics system, since the HLC is a young company they need to evaluate every process in order to achieve continuous improvement.

The Logistics Information System

Table 5.6 shows the key finding of logistics information system in HLC.

Table 5.6 Logistics Information System in HLC

<table>
<thead>
<tr>
<th>Logistics Information System</th>
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</tr>
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<tbody>
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<td>+/-</td>
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<tr>
<td>Research and Intelligence System</td>
<td>+/-</td>
</tr>
<tr>
<td>Reports and Outputs System</td>
<td>+/-</td>
</tr>
</tbody>
</table>

+/+ = It’s in the theory and the company is using it
-/+ = It’s not in the theory and the company is using it
+/- = It’s in the theory and the company is not using it

Prefect fit with the theory of Coyle (2003), HLC organized their e-Logistic information system in four main systems, namely planning system, execution system, research and intelligence system, and reports and outputs system. The planning system includes Material Requirements Planning (MRP), a very efficient tool and technology to forecast and control customer’s needs to plan and control. Supply Chain Planning (SCP) system and ERP, SCP integrates all the daily operation functions, including customer demand forecasts, resource allocations, equipment management, production schedules, and purchasing plans. ERP systems integrate those executive functions in operation flow, such as orders management, financial management, stock planning and production management. The execution system includes order management, order process, transportation, tracking and purchase management. All the retailers, HLC’s transportation companies and suppliers are involved in this system. The research and intelligence system is used to scan the strategic objectives, capacity restriction, logistics demand, manufacture demand, and purchase demand. After these processes, the reports outputs system starts its operation: it plans reports for planning system, operates reports for execution system, and controls reports for research and intelligence system.

The Value

Table 5.7 shows the key finding of the value created by e-Logistics system in HLC.
Table 5.7 The Value of e-Logistics System in HLC

<table>
<thead>
<tr>
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<td>+/-</td>
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<tr>
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<td>Fixed Assets</td>
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<tr>
<td>Administration Costs</td>
<td>+/-</td>
</tr>
<tr>
<td>Customer Cost Savings</td>
<td>+/-</td>
</tr>
<tr>
<td>Supplier Cost Savings</td>
<td>+/-</td>
</tr>
<tr>
<td>Customers Number</td>
<td>+/-</td>
</tr>
<tr>
<td>Tax</td>
<td>+/-</td>
</tr>
</tbody>
</table>

+/- = It’s in the theory and the company consider it’s important
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Time utility and place utility are two main aspects of value creation from logistics, as described by Coyle (2003). HLC considers the *place utility* is important but it’s not the value created by e-Logistics system. The *time utility* is created from the following aspects: the lower distribution time, JIT purchase, JIT supply chain, and JIT delivery. With the help of e-Logistics system, the promised deliver time of HLC’s logistics service is: 2 days for national lines the requests, 8 hours for key city requests, and 24 hours for of region requests. At the same time, HLC’s warehouse is just a transit station in which all materials can only be stored for 7 days at most. In HLC automated high-bay warehouses, parts and components are allowed for 3 days, and with the help of Vendor Managed Inventory (VMI) system, HLC eliminates the down time related to lack of material supply.

Economic value-added can be affected by e-logistics in four aspects: Revenue, Operating Costs, Working Capital and Fixed Assets (Lambert, 2000). Since HLC fully ussed the e-Logistics system, the revenue of Haier Group has been increased significantly from 8.32 billion USD in 2001 to 12.53 billion USD in 2005. The operating costs was decreased from higher levels of operational efficiency and improved customer service, as a result the cost of the finished products in Haier accounted for 7.9% of the sales income in 2004, whereas the national average was 30% for the 180 thousands domestic enterprises. The administration cost in Haier is accounted for 7.0% of the total commodity cost, whereas the cost in other enterprises was 15%. With the goal “zero working capital” HLC is trying to change cash into material objects and then convert material objects into cash, the working capital was decreasing rapidly. With the goal “zero stock”, HLC closed some warehouse. If warehouse is likened to a reservoir, HLC will change the reservoir into a flowing river by the JIT tools. HLS considers the customer cost savings, supplier cost savings, more customers and tax are significant value created by e-Logistics system too. The customer can save their cost since the e-Logistics system allows the delivery of products to customer at the most competitive prices. The supplier can save their cost by using Vendor Managed Inventory (VMI), both Haier Group and its suppliers are aware of
inventory levels through shared information on the Internet, now the suppliers have a better estimate of how many inventories Haier will need. Under "zero distance", Haier will, immediately after obtaining the purchase order, take every effort to satisfy the needs of customers. In past five years with the goal “zero distance” with global customers and quicker information value, Haier received 250,000 pieces of customer information, offering individualized design, an increase in customers to 2,180,000. Furthermore, the Tax is also a great aspect which must be consider in China, with the help of e-Logistics system, it increased from 363 million USD in 2000 to 530 million USD in 2005.

**5.2.2 How can the factors that influence the e-Logistics system be described?**

Table 5.8 presents a summary of key findings in regards to the factors that influence e-Logistics system in HLC:

<table>
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<tr>
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<td>+/-</td>
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<td>+/-</td>
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<tr>
<td>Test and support equipment factors</td>
<td>+/-</td>
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<tr>
<td>Organizational factors</td>
<td>+/-</td>
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<tr>
<td>Facility, transportation and handling factors</td>
<td>+/-</td>
</tr>
<tr>
<td>Software factors</td>
<td>+/-</td>
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<tr>
<td>Availability factors</td>
<td>+/-</td>
</tr>
<tr>
<td>Economic factors</td>
<td>+/-</td>
</tr>
<tr>
<td>Policy factors</td>
<td>-/+</td>
</tr>
</tbody>
</table>

+/- = It’s in the theory and the company is using it
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Respondents of HLC also state that reliability factors and maintainability factors are often important in e-logistics system. They look for service quality and reliability and often not in a position to risk production operations in search of 10-20% savings on items that constitute only 10-20% of their cost structure. As Blanchard (1998) said, as the reliability of a system increases, the frequency of maintenance will decrease and, conversely, the frequency of maintenance will increase as system reliability is degraded.

In maintainability factors, those factors contribute to maintainability are: modularity, interoperability, diagnostics, and prognostics.

HLC takes great efforts to maintain their supply system to provide data and interface for spares acquisition. As Blanchard stated that supply support includes the spare parts and the associated inventories necessary for the accomplishment of unscheduled and scheduled maintenance actions.
Data Analysis

Compare to VLC, HLC has less emphasized issues in terms of test and support equipment factors in e-logistics.

Characteristics of organization in HLC are Efficient communication between organizations, Network-assisted harmonization, Flat organizational configuration, Flexible, autonomic, and distributed cooperative organization activity, Organization unit: team and team network, Clearly stated responsibility, Team members: adaptation and generalist, Simplified management, Wide-range management.

The respondents of HLC consider that transportation is one of the most important factors. They use faster and more reliable transport to reduce contingency stocks or more long-distance transport to centralize inventory and reduce stock.

Information technology enables logistics and supply chain managers to meet demands by integrating systems, collaborating within and across corporation, and sharing information throughout the supply chain, enabling supply chain participants to plan and synchronize their processes. They recognize that business networks are growing in importance and in networks the meaning of logistics is a factor of competitiveness continues to increase.

The main problems of logistics environment in China mainland are mainly originated from insufficient hardware infrastructure, which has a negative impact on the development of e-commerce in China.

Policy factors does not exist in theory, however it impacts fulfillments of e-logistics in HLC in China. However, e-logistics system is influenced in HLC in China. China’s local governments hold great power and the lack of a coherent coordination logistics policy is likely to persist.

5.3 Cross-Case Analysis

*In this part of the analysis the two cases are analyzed across each other. Firstly, Research Question One is analyzed across the two cases, and then Research Question Two.*

5.3.1 How can the e-Logistics system be described?

Table 5.9 below shows the variables of the e-Logistics process.

**Table 5.9 The Process of e-Logistics**

<table>
<thead>
<tr>
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<tr>
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<td>+/-</td>
</tr>
<tr>
<td>Tracking</td>
<td>+/-</td>
<td>+/-</td>
</tr>
<tr>
<td>Evaluation</td>
<td>+/-</td>
<td>+/-</td>
</tr>
</tbody>
</table>

+/- = It’s in the theory and the company is using it
-/+ = It’s not in the theory and the company is using it
Both of two companies have three basic processes as Coyle (2003) described. We can see the RFQ, Shipping and Tracking are the most important process in e-Logistics system. Further, VLC added packaging as a main process in e-Logistic system since they have a well developed e-Logistics system and they want to fully implement the information technology in every part. HLC described evaluation is an important part, because HLC is a young company and it’s developing their e-Logistics system, the evaluation process is necessary for them to improve their logistics service.

Table 5.10 shows the key finding of logistics information system

**Table 5.10 Logistics Information System**

<table>
<thead>
<tr>
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<th>HLC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planning System</td>
<td>++</td>
<td>++</td>
</tr>
<tr>
<td>Execution System</td>
<td>++</td>
<td>++</td>
</tr>
<tr>
<td>Research and Intelligence System</td>
<td>++</td>
<td>++</td>
</tr>
<tr>
<td>Reports and Outputs System</td>
<td>++</td>
<td>++</td>
</tr>
</tbody>
</table>

++/ = It’s in the theory and the company is using it

Both two companies in this case study have divided their e-Logistics information system into four basic subsystems, planning system, execution system, research and intelligence system and reports and outputs system, fit the theory from Coyle (2003). This might be a sign of that these systems should provide the logistics manager with timely and accurate information for the basic management functions of planning, implementation, and control.

Table 5.11 shows the key finding of the value which is created by e-Logistics system.

**Table 5.11 The Value of e-Logistics System**

<table>
<thead>
<tr>
<th>The Value of e-Logistics System</th>
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<td>Place Utility</td>
<td>+/-</td>
<td>+/-</td>
</tr>
<tr>
<td>Time Utility</td>
<td>++</td>
<td>++</td>
</tr>
<tr>
<td>Revenue</td>
<td>++</td>
<td>++</td>
</tr>
<tr>
<td>Operating Costs</td>
<td>++</td>
<td>++</td>
</tr>
<tr>
<td>Fixed Assets</td>
<td>++</td>
<td>++</td>
</tr>
<tr>
<td>Working Capital</td>
<td>+/-</td>
<td>+/-</td>
</tr>
<tr>
<td>Administration Costs</td>
<td>+/-</td>
<td>+/-</td>
</tr>
<tr>
<td>Customer Cost Savings</td>
<td>+/-</td>
<td>+/-</td>
</tr>
<tr>
<td>Supplier Cost Savings</td>
<td>+/-</td>
<td>+/-</td>
</tr>
<tr>
<td>Customers Number</td>
<td>+/-</td>
<td>+/-</td>
</tr>
<tr>
<td>Tax</td>
<td>+/-</td>
<td>+/-</td>
</tr>
</tbody>
</table>

++/ = It’s in the theory and the company consider it’s important

/-/ = It’s not in the theory and the company consider it’s important

+-/ = It’s in the theory and the company consider it’s not important

-/- = It’s not in the theory and the company consider it’s not important
Data Analysis

Both cases indicate that, place utility is important but it’s not created by e-Logistics system and time utility is a main aspect of value from e-Logistics system. Both companies not only describe the economic value-added by e-logistics in four aspects: Revenue, Operating Costs, Working Capital and Fixed Assets following the theory from Lambert (2000), but also add the Decrease of Administration Costs and the Increase of Customer Cost Savings as the main value which are created by e-Logistics system. At the same time, HLC adds the Decrease of Supplier Cost Savings, the Increase of Customers Number and the Increase of Tax as the main value from e-Logistics system. The reason for this might be that VLC enters logistics market earlier than HLC and adopt globe strategy earlier, which might lead to that they have more time and knowledge to spend on the design of their e-Logistics Information. On the other hand, HLC is a young company, they need to help their supplier, improve theirselves and gain new customers as many as possible, also HLC is a Chinese company; the tax is always a very important aspect in value creation.

5.3.2 How can the factors that influence the e-Logistics system be described?

Table 5.12 displayed below shows the variables of the factors that influence the e-Logistics system.

Table 5.12 The factors that influence e-Logistics system

<table>
<thead>
<tr>
<th>The Factors</th>
<th>VLC</th>
<th>HLC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reliability factor</td>
<td>+/-</td>
<td>+/-</td>
</tr>
<tr>
<td>Maintainability factors</td>
<td>+/-</td>
<td>+/-</td>
</tr>
<tr>
<td>Supply support factors</td>
<td>+/-</td>
<td>+/-</td>
</tr>
<tr>
<td>Test and support equipment factors</td>
<td>+/-</td>
<td>+/-</td>
</tr>
<tr>
<td>Organizational factors</td>
<td>+/-</td>
<td>+/-</td>
</tr>
<tr>
<td>Facility, transportation and handling factors</td>
<td>+/-</td>
<td>+/-</td>
</tr>
<tr>
<td>Software factors</td>
<td>+/-</td>
<td>+/-</td>
</tr>
<tr>
<td>Availability factors</td>
<td>+/-</td>
<td>+/-</td>
</tr>
<tr>
<td>Economic factors</td>
<td>+/-</td>
<td>+/-</td>
</tr>
<tr>
<td>Policy factors</td>
<td>+/-</td>
<td>+/-</td>
</tr>
</tbody>
</table>

+/+ = It’s in the theory and the company is using it
-/+ = It’s not in the theory and the company is using it
+/- = It’s in the theory and the company is not using it
-/+ = It’s not in the theory and the company is not using it

According to the compared result, we found that:

- Most of the factors are used in both corporations with different level of emphasis.
- Both corporations treat reliability factors and maintainability factors as important factors. Respondents of VLC state that reliability factors and maintainability factors are often important in e-logistics system. HLC takes great efforts to maintain their supply system to provide data and interface for spares acquisition.
Both corporations consider that software factors and facility, transportation and handling factors are also equally important.

In order to achieve a global synchronized electronic supply chain, both corporations have to deploy a global strategy that enables all players to benefit from the e-system. VLC were responsible for the development of e-logistics in their company. Information and communication technology have played a key role in transforming logistics and supply chain planning.

Relatively, availability factors and economic factors are medium-level important in VLC case.

Available factors are medium-level important in VLC, however it is low-level important in HLC.

Organizational factors and test and support equipment factors are low-level important in both VLC and HLC.

Supply support factors are medium important in VLC, however it is not important to influence HLC e-system.

Due to the different culture and policy, there are specific factors the influence HLC e-system.
6. Conclusions and Implications

In the preceding chapter we analyzed the empirical data of the two cases. In this chapter we answer two research questions and provide overall conclusions regarding the findings of this study. At the end of this chapter we give implications for management and theory.

6.1 Findings and Conclusions on Research Questions

6.1.1 RQ1: How can the e-Logistics system be described?

Our finding indicate that the e-Logistics system can be described from five sub-processes, there are Request For Quotes (RFQ) Process, Packaging Process, Shipping Process, Tracking Process, and Evaluation Process.

It is rather different between a large and experienced global logistics service provider and a local and young company serving mainly domestic. Because of these differences they organize their e-Logistics processes in different ways. This indicates that a company’s e-Logistics process differs depending on the experience the company has and the developing level of their e-Logistics system. Both of them utilize RFQ process, shipping process, and tracking process because these are very basic processes of e-Logistics system; the differences appear in packaging process and evaluation process. The large and experienced global logistics service provider emphasizes on packaging process since they are trying to optimize all detail processes of their e-Logistics system; while the local and young one goes into deeper level by applying evaluation processes into its e-Logistics systems, because they need to implement continual improvement.

Our findings indicate that the logistics information system can be divided into four sub-systems as Planning System, Execution System, Research and Intelligence System, and Reports and Outputs System.

This might be a sign of that these systems should provide the logistics manager with timely and accurate information for the basic management functions of planning, implementation, and control. Our findings indicate that the planning system is served for such needs as network design, demand planning and forecasting, strategic sourcing, production planning and scheduling, and distribution planning; the execution system is always a web-enabled and globe-accessible system that integrates the information technology. The execution system became more effective by optimizing space utilization in the warehouse, increase productivity, effective coordination of people and equipment, schedule and route transportation for low cost and high revenue, and minimize the errors. This sub-system also became more flexible by gearing to a variety of companies and situations, and including support for the involvement of business partners. Finally, the execution system became more transparent by a highly integrated, user-friendly information exchange system which provides information on all key activities, allow both global and local companies to track progress and position of goods in transit, to monitor the status of orders and to act on the insight they gain; and also by providing links to other business applications. The research and intelligence system is used in global
Conclusions and Implications

logistics company for tactical optimization mainly, on the other hand, it’s used in local logistics company for demand search, the difference appeared since the different developing level of two companies. The reports and outputs system is almost the same in global logistics company and local logistics company, all include planning report, operating report and control report, it indicate that in the firm’s logistics area, high-quality communication through appropriate report and outputs should be the standard, not the exception.

The economic value added from e-Logistics system differs between the companies, and we have found that the e-Logistics system adds great value to the companies, in the following ways: *Time Utility, Revenue, Operating Costs, Administration Costs, Fixed Assets, Customer Cost Savings, Supplier Cost Savings, Customers Number, Working Capital, and Tax.*

Our finding shows that the place utility is important but it’s not created by e-Logistics system. The time utility is considered as an important aspect of value creation from e-Logistics. Both global logistics company and local logistics company consider the value added form revenue, operating costs, administration cost, fixed assets and customer cost saving. At the same time, the working capital can only be saved from adopting e-Logistics system when the company is young. The decrease of supplier cost savings and the increase of customer number from the help of e-Logistics system can only affect the young logistics company. The value of tax is the production of the culture and political background in China, since in China, when the company states their contribution, how much tax they have paid is always a very important part in this process.

From these findings we can more specifically conclude:

- The e-Logistics system can be described from process, information system and value.
- The process of e-Logistics can be described from five sub-processes, there are Request For Quotes (RFQ) Process, Packaging Process, Shipping Process, Tracking Process, and Evaluation Process.
- The logistics information system can be divided into four sub-systems as Planning System, Execution System, Research and Intelligence System, and Reports and Outputs System.
- The e-Logistics system adds value to the companies, in the following ways: Time Utility, Revenue, Operating Costs, Administration Costs, Fixed Assets, Customer Cost Savings, Supplier Cost Savings, Customers Number, Working Capital, and Tax.
- The company’s e-Logistics system differs depending on the experience the company has and the developing level of their e-Logistics system.
- The culture and political background affect the value creation of e-Logistics system.
6.1.2 RQ2: How can the factors that influence the e-Logistics system be described

Our findings indicate that most of factors influence the e-logistics in both global and local logistics corporations. However, the degree of importance of factors is different. Table 6.1 presents the ranking of importance of factors in both kinds of corporations.

Table 6.1 The ranking of importance of factors in companies in Sweden and China

<table>
<thead>
<tr>
<th>Factors</th>
<th>Grade</th>
<th>Sweden</th>
<th>China</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reliability factor</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Maintainability factors</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Software factors</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Facility, transportation and handling factors</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Availability factors</td>
<td>2</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Economic factors</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Test and support equipment factors</td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Organizational factors</td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Supply support factors</td>
<td>3</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Policy factors</td>
<td></td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

1 = most important  
2 = somewhat important  
3 = less important

We found that reliability factors, maintainability factors, software factors and facility, transportation, and handling factors are same important in both kinds of corporation. In order to achieve a global synchronized electronic supply chain, both corporations have to deploy a global strategy that enables all players to benefit from the e-Logistics system.

For a global and experienced logistics company, we found that availability factors and economic factors are less important. However, in a local and young logistics company we found that economic factors and supply support factors are less important. Due to the reason of different culture and policy, some specific factors influence e-logistics system to some extent.

From these findings we can more specifically conclude:

- Reliability factors, maintainability factors, software factors and facility, transportation and handling factors act key role when we consider the factors that influence the e-logistics system.

- Organizational factors and test and support equipment factors are low-level important for e-logistics system.

- Due to some regional and political reasons, some logistics factors do not exist in the theory.

- The same factors have different level of impact to different kinds of companies.
Conclusions and Implications

6.2 Implications and Recommendations

At the final section the implications and recommendations from our findings and conclusions are presented. We provide implications for practitioners, management, and theory, as well as recommendations for future research.

6.2.1 Implications for Practitioners and Management

➢ When implement the e-Logistics system, it’s crucial to have a clear picture of current level of your company.

➢ When design e-Logistics processes, the steps are different for different kinds of logistics companies. For a young company, continue improvement is important so evaluation process must be considered; for an experienced company, adopting e-Logistics systems in every detail process is important.

➢ When design a e-Logistics Information System, it’s important to have a structured system to follow. This provides logistics manager with timely and accurate information for the basic management functions of planning, implementation, and control.

➢ When evaluating the value of e-Logistics system, it’s important to recognize the current situation of the company. Different level of development emphasize on different aspects where the e-Logistics create value.

➢ When considering the factors that influence an e-Logistics system, it’s important to recognize that the same factors have different level of impact to different kinds of companies and some factors exist due to regional or political reasons.

6.2.2 Implications for Theory

Our overall purpose of this study was “provide a clear understanding of how organizations utilize e-Logistics to create value within the Supply Chain.” As we have found many previous studies on e-Logistics system have focused on process, information system, value and influential factors.

This study has explored and described a phenomenon within the specific research area. To be able to reach our purpose, we have investigated two research questions. More specifically, for research question one it was detected that the existing e-Logistics theories verified, to a relatively extent, with the empirical findings of this study. When it comes to the companies staying in the different level of development, the emphasis of e-Logistics system is different and some new aspects should be added. Regarding research question two, the majority of the findings for this study show that the current theory is mostly about traditional logistics. The fundamental logistics theory in term of the factors that influence e-logistics system are not well-established yet, to describe more factors that impact e-logistics system is necessary. In addition, this study provides a foundation from which further studies may be done.
Conclusions and Implications

6.2.3 Recommendations for Future Research

- This study provides an insight of e-Logistics system for companies which stay in the different level of development. It’s interesting to further investigate more differences of different level.

- This study provides an insight of some factors that influence the e-Logistics system due to regional or political reasons. It’s interesting to investigate more regional companies in different countries.

- According to current study, e-logistics are widely used in big companies. How similar systems are used in small companies and to what extension they are used could be one interested topic to investigate.

- This study provides experimental investigation for the future development of current e-logistics theory.
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Appendix A

Interview Guide   (English Version)

Background of Companies

Company name:  
Location:  
Annual turnover:  
Number of employees:

Background of Respondents

Name:  
Title:  
Department:  
Years in the firm:

Description of e-Logistics System

The Process of e-Logistics
1. Did your company adopt the e-Logistics system?

2. How to describe the activities of e-Logistics system in your company, such as what will you do when do planning, transaction and execution and etc.?
   - Request For Quotes (RFQ)
   - Shipping
   - Tracking

Logistics Information System

3. How does your company organize the logistics information system? And can you describe the detail of every part in your logistics information system?
   - Planning system
   - Execution system
   - Research and intelligence system
   - Reports and outputs system

Value

4. How does e-logistics system create value for your company such as place utility, time utility, and etc?
   - Place utility
   - Time utility
Appendix A

- Revenue
- Operating costs
- Working capital
- Fixed assets

*Factors that Influence the e-Logistics System*

5. Can you describe the factors that influence your e-Logistics system?

- Reliability factors
- Maintainability factors
- Supply support factors
- Test and support equipment factors
- Organizational factors
- Facility, transportation, and handling factors
- Software factors
- Availability factors
- Economic factors, and Effectiveness factors
Appendix B

Interview Guide (Chinese Version)

公司背景

公司名:
公司地点:
年营业额:
雇员总数:

采访对象背景

姓名:
职位:
部门:
服务年限:

电子物流系统

电子物流过程
1. 你们公司采用电子物流系统吗？

2. 怎样描述你们的电子物流系统，如计划，运输与执行的过程？
   - 配额 (RFQ)
   - 运输
   - 跟踪

物流信息系统

3. 你们公司是怎样组织物流信息系统的？能不能详细的描述每一部分？
   - 计划系统
   - 执行系统
   - 研究系统
   - 报告系统

价值

4. 电子物流是怎样为你们公司创造价值的？在时间和空间上以及其它。
   - 空间上
   - 时间上
影响电子物流系统的因素

5. 请描述一下影响你们电子物流系统的因素

- 可靠性
- 可维护性
- 供应链支持
- 设备支持
- 组织因素
- 工具，运输和处理
- 软件
- 实用性
- 经济和效率