

THE IMPACT OF OUTSOURCING ON LOGISTICS

- Case study at Volvo -

A. HÄGG

Industrialization and Production Development
Volvo Construction Equipment Components AB
Eskilstuna, Sweden
anette.hagg@volvo.com

A. ANDERSSON

IS/IT
Volvo Construction Equipment Components AB
Eskilstuna, Sweden
anna.b.andersson@volvo.com

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Abstract: *The business today is dominated by change and uncertainty. It is getting more and more global and the increased expectations from the customers' leads to higher demands on the businesses. The objective of this paper is to identify critical parameters that affect the efficiency of companies' logistics. The aim is also to investigate which of the logistics parameters should be considered before taking sourcing decisions.*

The paper will review literature within related areas and present a case study performed at a company within the Volvo group. The conclusion is eleven parameters which are affecting the efficiency in the logistics system and nine should be considered before taking sourcing decisions and they are; delivery capacity, delivery dependability, capacity and technical equipment, total cost, quality, transportation cost, physical distance, flexibility and planning/ steering.

1. INTRODUCTION

Well developed, cost efficient logistics- and transportation systems provide a fundamental condition for countries prosperity and the growth of the industry. Increased competition results in demands on shorter lead time and more just in time deliveries. Outsourcing of manufacturing also leads to a decreased degree of self-support in the company and more articles are made by external suppliers (Mattsson, 2002a). The result is more complex material-flows between the complicated networks of companies. This means that the importance of logistics and collaboration increases, and so also the cost.

The whole logistics concept, including sourcing, is nowadays more and more strategically. The management influence has increased and the logistics concept is now on a high management level.

The case study, that this paper is based upon, was conducted at a company within the Volvo group in Eskilstuna, Sweden. The case study investigates the influence on the efficiency of the logistics system when outsourcing. The aim was to define which parameters are important to be able to obtain efficient logistics and which of these parameters should be considered when taking sourcing-decisions?

This paper is structured as follows. First, theories about case studies will be described as well as used method for this paper. Secondly, in the theoretical overview, relevant theory connected to sourcing and logistics will be described from a theoretical view. Furthermore, the paper will describe the context and results from the case study made in Sweden. Finally, possible future work will be described.

2. METHODOLOGY

The case study is, according to Yin (1994) one of a number of ways of doing science research. Other ways includes experiments, surveys, histories, and analysis of archival information. Each strategy has advantages and disadvantages, depending on three conditions; (1) the type of research question, (2) the control an investigator has over actual behavioral events, and (3) the focus on contemporary opposed to historical phenomena. He also mentions that case studies is a suitable research strategy if the research questions asked are in the form of "how" and "why", when the investigator has little control over events, and when the research wants to cover contextual conditions.

During a case study different sources of evidence can be used for data collection. The more sources used when collecting data the more secure will the reliability of the study be. The most common ways of collect data within a case study are (Yin, 1994):

- ✓ Documentation
- ✓ Archival records
- ✓ Interviews
- ✓ Direct observation
- ✓ Participant observation
- ✓ Physical artifacts

Three of the above sources of evidence have been used in the case study in this paper. The authors' opinion is that these sources; documentations, interviews and direct observation, are highly complementary and therefore give a comprehensive picture of the company's relationship and environment.

Documentary information is important for nearly every project. The collection of data may consider administrative documentation, letters, and communiqués etc. The strength of documentation is that the data can be reviewed over and over again and it is precise. A major problem is that there can be a lack of access. *Interviews* are a common method used when collecting qualitative data. There are different types of interviews; there are very structured interviews, almost like a questionnaire and there are interviews that are rather similar to a normal conversation (semi-structured) and interviews that are quite unstructured. Which type of interview is chosen depends on how the researcher plans to treat the data. The strength of interviews is that it focus on the case study topics, you may guide the respondent into the right area. The weakness that follows is that the interviewer could guide the respondents' answers to desired answers. *Direct observation* has the advantages to cover events and contexts of events in real time, but is time and money consuming and highly selective (Yin, 1994).

This paper is based on a literature overview within the area of in- and outsourcing, rightsourcing, logistics and competitive priorities. The literature overview has been input to the performed case study at a company within the Volvo group. The case study is a way of research where the current phenomenon is investigated in its natural context (Yin 1994). The empirical data, for this paper, was collected by semi-structured interviews, which is a common way to proceed within case studies.

Several interviews, mostly at management level, where conducted at a company within the Volvo group. The interview questions were sent to the respondents in advance. The research questions to be answered were:

- ✓ Which critical parameters affect the efficiency of companies' logistics and how?
- ✓ How and which parameters need to be regarded at outsourcing-decisions?

The findings from the different sources were analyzed together. The analyses were also compared with findings from literature within the area of relevant theories and other research connected to the area.

Case studies are however often criticized for lack of statistical reliability and validity. Also, it is argued that the risk in using only a few case studies is the loss of external validity. Still, the insight and relatively deep understanding facilitate analytical generalization so that findings can be generalized to theory (Yin, 1994). To overcome this dilemma; it is increasingly important to select a representative case and validate the result continuously and not simply at the end of the study. Also, it is significant to describe the actual case carefully and only draw conclusions that are valid only for similar systems.

3. THEORETICAL OVERVIEW

The theory section will describe outsourcing, reasons for choosing outsourcing but also external and internal risks about outsourcing. It will also give an account of insourcing and rightsourcing. The theory chapter will also define and discuss logistics and collaboration.

3.1 In- and outsourcing

Entering the third millennium, the industry faces an environment with a great deal of uncertainty, fast changes and intensified conditions both in the marketplace and the corporate boundaries. In earlier times, the customer mainly focused on low cost, high quality and high delivery capacity. Nowadays, customers also expect short product life cycle and time-to-market, customization and

innovativeness. At the same time, the products are becoming more complex and the techniques used are more complicated. Success in manufacturing, and indeed survival, is therefore increasingly difficult for companies to ensure. One way for companies to survive is to focus on their core competence and therefore move parts of the manufacturing to external suppliers. Outsourcing has, as a result of that, become a trend.

Some of the most commonly reasons mentioned in literature for outsourcing are; cost reduction, access to other companies' competence, focus on core competence, divided risk and flexibility (Mattsson, 2002a; Axelsson, 1998; Bengtsson, 2001; Ford et al, 1993). But the most common driving force for outsourcing is nevertheless stated as cost reduction (Mattsson, 2002a). Outsourcing has many different definitions but most of them are meaning that external suppliers perform something that was earlier made in-house. Swedish Metal Workers Union has added "the future need" to really be about outsourcing. The definition, as can be seen below, is the same used as in this paper (Metall, 2002);

"When a company hires an extern supplier for something that was earlier performed internally. To really be about outsourcing, the company must earlier have performed the activity and continuously have a need of the goods or the services."

Risks of outsourcing are a topic that is commonly discussed today and the theory has, according to Wasner (1999), divided the risks as being either externally or internally oriented.

Externally oriented risks

Loss of skills - are the loss of critical skills or the risk of developing wrong skills over time. Companies change and so does the core competence which can make it hard for companies to insource the function/ product again if they don't have the skills needed. *Loss of control* - there is always a risk when outsourcing that the supplier build up their expertise and become a competitor. The supplier could also try to sell knowledge learned during the outsourcing process to a competitor. *Intellectual property rights and confidentiality* - outsourcing can result in some difficulties about immaterial rights like who own the intellectual property rights and who can spread the information to a third part.

Internally oriented risk

The internally oriented risks are according to Wasner (1999); loss of cross functional skills and negatively employee morale. *Loss of cross functional skills* is due to that co-operation between different departments of the company, some now

being outsourced, is reduced. Co-operation will normally yield process improvements and other clever solutions which now might be missed. Outsourcing may also lead to negative effects if the aim of the outsourcing isn't clearly communicated; the *employee's morale* can be affected negatively because of anxiety or uncertainty. It is of grate importance for companies to be aware of this since the results of the outsourcing are rather dependent on the employees and their skills.

Since the trend has turned from making internal to buy more from external suppliers the logistics system has become more complex. If companies outsource a whole lot of their activities, there is a risk that the logistics increases so much that the company loose control over the logistics system. If that happens, companies start to loose efficiency about the logistics which cost both money and a lot of time. Therefore is it nowadays essential for companies to focus on the logistic area when outsourcing.

Many of the outsourced cases haven't been such a success as expected. One of the reasons could be that many companies base their outsourcing decision on short-term cost reduction instead of a strategic perspective (Ford et al, 1993). Many of these companies have the hard way learned that the disadvantages of outsourcing sometimes are huge and to save the company many activities have been taken back into internal production. Insourcing has therefore been a more frequent used strategy (Hägg & Granlund, 2003). The most important advantages with insourcing seem to be; less logistics-and administration cost, faster communication, flexible integration of new technologies, short time to market and technology core competence stays in-house. There are however disadvantages even with insourcing and some of them are; less risk sharing and large-scale production, higher investment cost, less focus on core competence and low utilization.

3.2 Rightsourcing

Theories about in- and outsourcing indicate that both in- and outsourcing have advantages and disadvantages. Therefore it is better for companies to ask themselves which sourcing strategy is the best for them in the specific situation. They should use the right sourcing strategy for the right situation - Rightsourcing. In this paper rightsourcing is defined as (Hägg et al 2004);

"Rightsourcing means to actively apply in-and outsourcing on a strategic approach to be competitive now and in the future."

The idea behind rightsourcing is that companies shouldn't use in- or outsourcing without consideration; instead they should use both of them

in a strategic way to improve their competitive priorities. There are three things in the definition of rightsourcing that the authors believe are really significant;

- ✓ The first important thing, in the definition, is to **actively apply** in-and outsourcing. The thought with rightsourcing is that it shouldn't be a "surprise" or "happening" that the company outsources or insources parts of their organization. The decision shall be well analyzed before taken.
- ✓ The second significant thing is the **strategic approach** for sourcing questions. Companies shall follow their business- and production strategy when taking the sourcing decision.
- ✓ The third significant thing about rightsourcing is to be **competitive now and in the future**. To survive and be able to compete in the long run companies must think and act in a holistic view and avoid sub optimization. There shall also be a continuous process between in- and outsourcing, only acting in one direction is not optimal for any company.

When talking about rightsourcing, a question often appears, and this is - what are the difference between in-and outsourcing and rightsourcing? And the answer lies, according to the authors, in the definition and the three significant bullets above.

Another type of rightsourcing is an internal optimization of the production by moving production between the internal sites.

As mention earlier there are more aspects, in addition to cost, sourcing strategies must take into consideration. One of them is the logistics aspects. It is, according to Mattsson (2000a) important to include the logistics aspects in the sourcing decision since the consequences can be large. Mattsson (2000a) describes the consequences outsourcing of manufacturing obtains from a logistic point of view. These consequences are briefly described below;

- ✓ A more complex material flow between involved companies. The administrative work (and of course cost) can also be increased.
- ✓ Transportation cost increases.
- ✓ The transportation time will be longer and so even the throughput time and delivery time to customer. This could also lead to increased amount tied-up capital.
- ✓ When outsourcing is used it is hard to reach the same amount of flexibility and possibility to reschedule orders compared to in-house production.
- ✓ Less possibility to give priority to orders due to less influence on decisions.
- ✓ The company who outsource manufacturing will reduce its amount of raw material and WIP. This will instead be moved to the

supplier. It is however important to have in mind that in the total supply chain the amount tied-up capital is the same (or even higher).

Every company and every decision is unique and therefore it is necessary with a decision in each case, regarding outsourcing, which has both opportunities and risks (Minoli, 1995). Unfortunately it is not unusual that the make or buy decisions in the companies are not very well-founded (McIvor, 2000). However, the literature shows that, there are some already established frameworks for companies to choose from when it comes to outsourcing, but insourcing models are still not so usual in the theory. There are e.g. models for cost analysis made by Williamson (1975) and more mathematical outsourcing models made by e.g. Mock & Millar (1970) and Yoon & Naadinutha (1994). But there are more aspects sourcing decision must take into consideration, in addition to cost. Welch & Nayak (1992), Probert (1996), Insinga & Werle (2000) and Fill & Vissers (2000) have all formulated more universal frameworks which also consider general aspects. McIvor (2000) have developed a model that combine the sourcing decision with the companies' allover strategy.

The logistics is today only included in a minority of the sourcing decisions made. The reason why logistics isn't discussed, when it comes to outsourcing, is probably hence it almost always brings negatively consequences and a more complex logistics system (Mattsson, 2002a).

3.3 Logistics

During the 1940's and 1950's logistics was introduced among researchers and the industry in the USA. Logistics has been developed from being a military concept for moving forces and material to being a fundamental condition. This is made to be able to manage a company's activities in a successful way (NUTEK, 1998).

The trend of globalization and the increasing extent of specialization have resulted in an increased need of transportation within companies and also between companies, countries and regions. A requirement to reach this increased globalization and specialization is access to reliable, frequent and fast transports. The production philosophies today, for example just-in-time and outsourcing, are getting more common and put higher requirements on efficient flows of information in the supply chain, especially in a customer driven production (NUTEK, 1998).

Storhagen (2003) mentions that nowadays the concept of logistics, including sourcing, concerns more and more strategically questions. The

management influence has therefore increased and the logistics questions are now on a higher management level in the companies.

A strong motive for why the importance of logistics is increasing (except from the trend of outsourcing) is that it is no longer the production that is the critical competence today, instead it is the flow (Mattsson, 2002b). Example of important flows are; the physical flow, in form of material and goods, and the flow of information and payments (Storhagen, 2003). According to Ballou (1992) the maximum logistics control usually can be expected over the immediate physical supply and physical distribution channels.

The development of the logistics is accelerating and there are many reasons for that. According to Storhagen (2003) there are two strong driving forces the last years behind this;

- ✓ A very strong focus on the customer
- ✓ A development towards collaboration within and between organizations

Collaboration

Today the organizational discussion in the logistics context is about how different companies and organizations in the best way are able to collaborate to achieve high competitiveness together. Traditionally the focus has been on individual companies, individual functions and individual machines. It gives entirely new dimensions and opportunities if you instead look towards what is between the companies, functions and machines (Storhagen, 2003). With the foundation in the picture over the scope of business logistics for the individual by Ballou (1992) and adding the important part of collaboration in the interfaces (supply-manufacturing-distribution) you reach a picture describing the logistics system with the focus for collaboration in the external interfaces, see figure 1 (Andersson & Jackson, 2004).

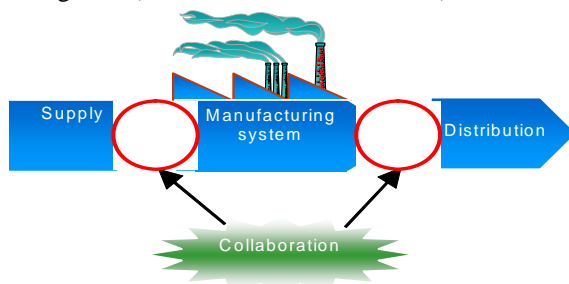


Fig. 1. *The logistics system with collaboration in the external interfaces (Andersson & Jackson, 2004).*

The central concept of a relationship approach is concerned with the collaboration and sharing of resources; physical (such as machinery) or intangible (such as intellectual know-how,

technological processes) as well as the primary goal of gaining competitive advantage. This is made through improvements in product and process redesign, making both firms more efficient in the supply of the end product (Cousins, 2001).

Definition logistics

From the beginning logistics was more equal to physical movements, but today the logistics has a much more integrated view of all flows of resources and information made in a supply chain from raw material to end customer. In this paper the used definition of logistics originates from the Council of Logistics Management (CLM), a professional organization of logistics managers, educators, and practitioners formed in 1962, Ballou (1992);

“Logistics is the process of planning, implementing, and controlling the efficient, cost-effective flow and storage of raw materials, in-process inventory, finished goods and related information from point of origin to point of consumption for the purpose of conforming to customer requirements.”

Efficient logistics

For all companies the overall goal is to make a profit (Goldratt, 1984). To reach this goal it is important to always work with your organization and reach efficiency in the company. The logistics is no exception and is also here an significant concept. When you talk about the influence of profitability efficiency there is inner and outer efficiency. According to Mattsson (2002c) the inner efficiency, in the perspective of flow of material, is how well the business processes and materials control are working as an instrument for value-processing and material-moving activities. The outer efficiency can be seen as the valuation from the market of the company's performance (what the company can deliver in proportion to what the customers expect). The inner efficiency is mostly connected to the parameters tied up capital and costs. Efficiency parameters which are strongly affecting the outer efficiency are delivery time, delivery capacity and flexibility (Mattsson, 2002c).

3.4 Competitive priorities

Efficiency and logistics can be related to competitive priorities. The issue about competitive priorities originates from Skinner (1969) and has been discussed comprehensively ever since. Quite a few researchers, among others White (1994) and Rudberg (2002), have partly based their motivation and reasoning on competitive priorities. Competitive priorities are internal demands defining in which way a company will compete in the future thus guiding to the best logistic and sourcing solution for a particular company. In this

paper, five competitive priorities are briefly described and those are; quality, cost, delivery, flexibility and skills to innovate.

- ✓ *Quality* is a frequently used term with many different definitions. Garvin (1993) separated quality in eight factors; performance, features, reliability, conformance, durability, serviceability, aesthetics and perceived quality. Logistics directly affects e.g. the delivery performance and the serviceability of products.
- ✓ *Cost* for a product is not only the price of purchasing it; it is also the cost for operating and maintaining it. There can be different types of cost e.g. initial cost, operating cost and maintenance cost Garvin (1993). Logistics and sourcing affect the operating cost by e.g. cost of transportation and cost of material handling within the manufacturing system.
- ✓ *Delivery* has not always been seen as a part of the competitive priorities, but nowadays it is a valuable way for companies to compete against each other. Delivery can be divided into three different areas: speed, reliability and ease of ordering Garvin (1993). Speed in a delivery process is very much affected by the complexity of logistics within the supply chain and the degree of outsourcing.
- ✓ *Flexibility* has many different definitions. Olhager (1996) mentions three types of flexibility; volume flexibility, flexibility in your product mix and the flexibility when entering new products and techniques. Outsourcing leads almost always to negative impact on companies' flexibility. The ability to handle volume variation is greatly dependent on the choice of logistic solutions and the performance of the supply chain.
- ✓ *Skills to innovate* are about how a company actively can contribute to the development for easy production. It can also be about how fast the new techniques, methods and products are introduced. Developing new products with short development time is nowadays a significant competitive device and has a connection to both logistics and sourcing.

From the concept of competitive priorities, it is obvious that a company can compete in many other ways than the pricing of products. Focusing on all competitive priorities simultaneously can be extremely difficult, if not impossible, for a single company. Therefore trade-offs must be made and some of the competitive priorities have to be more focused than the others, without affecting the customer negatively. The five competitive priorities mentioned above are all measurable in one way or another, and this make them important parameters when discussing and evaluating efficient logistics and sourcing decisions.

4. CASE STUDY AT VOLVO

Except for the literature study, a case study has been used to collect the empirical material for this paper. The case study was performed at a company within the Volvo group (hereby referred as Volvo). The interviews were conducted with persons within logistics, purchasing and production. They were mostly performed with people in management position, due to the increased need of focusing these questions on a management level.

The case study investigates the influence on the efficiency of the logistics system when outsourcing. The aim was to define which parameters are important to be able to obtain efficient logistics and which of these parameters should be considered when taking outsourcing-decisions? The research questions to be answered were;

- ✓ Which critical parameters affect the efficiency of companies' logistics and how?
- ✓ How and which parameters need to be regarded at outsourcing-decisions?

The case study company, within the Volvo group, competes within the mechanical industry. The company has internal marketing/sales, product development and production department. The number of employees is approximately 1000, and a bit more than 60 per cent of these persons are working within the manufacturing department.

Volvo acts in a turbulent and global market. The competition from other companies is increasing and to be able to survive in the future, there is a need of high competence within the company (especially within production engineering). The steel price all over the world is rising, at the same time as Volvo's volumes and forecasts are greater than ever. On top of that many new generations of products are being prepared for serial production. Therefore many activities are going on in the company to be able to deliver the high amount products the customers ask for. Some of them are summarized in the text below.

Since the volume is higher than ever, the maximum capacity is soon reached (at least in parts of the factory). One way to still be able to deliver is to invest in new machines. This has been done by Volvo in some cases but can not be a solution for the entire machine park. This due to the risk that the volume in the future is decreasing and the company does not want to have such an enormous amount capital bounded in machines at that time. Instead, Volvo has been focusing on increasing the productivity in existing machines, optimizing which products to subcontract and analyzed new candidates for outsourcing to external suppliers.

When dealing with external suppliers Volvo has during the latest year been extra careful to try to secure capacity also at their suppliers.

To be able to maintain the high quality on top even after the increased volumes will demand prevention and extra work from the quality departments and other support functions like purchasing and logistics. This means that the company needs to search for more competent staff, which sometimes can be hard to recruit. Volvo also investigates the ability to modify today's working hours to be able to produce more components in-house. They must however find a balance between the additional cost (it can be very expensive to increase shifts at evening and nights) and how much extra components they are gaining on the new shifts.

A further difficulty that Volvo is dealing with is their old hardening shop which is located about 5 miles from the factory. It is now old and maybe not trustful for so long time further and Volvo is therefore building a new one. The company hopes to achieve less lead time, less transportation costs, secure good quality and deliveries but also to reach less complex logistics with the new hardening shop.

The current situation for Volvo with new demands and challenges, as described above, shows on a turbulent situation and a lot of the mentioned areas will have an influence on the logistics and the sourcing situation. Since the volumes are increasing and the company is doing well there is a fine atmosphere within the company at the moment and this facilitates further development within the company.

5. RESULTS FROM CASE STUDY

The current situation for Volvo with new demands and challenges, as described in chapter 4, shows on a turbulent situation and a lot of the mentioned areas will have an influence on the logistics and the sourcing situation.

The interviews have resulted in some parameters which the interviewed persons at Volvo did regard as important for efficient logistics and sourcing decisions. To be competitive and reach efficient logistics the two parameters **delivery capacity** and **delivery dependability** are significant, according to the case study, since the deliveries (in right time) are significant to get the production running. Volvo considers the delivery capacity as the probability to be able to deliver when the need arises and the delivery dependability is the capability to deliver correct products in the correct quantity. The interviewed persons think it is important to ensure that the chosen **supplier has enough capacity** for the company's volumes and **correct technical**

equipment to perform the articles. This is because it is important to be able to secure the deliveries from the supplier. A lot of factors are influencing the parameter **total cost** in the logistics system and therefore the respondents consider the total cost as an essential parameter to follow up and work with. The **cost for the transportation** of the material within the logistics system is a parameter that should be regarded when discussing efficient logistics and sourcing decision, according to Volvo. The transportation cost is a part in the total cost and is crucial for the lead time and will affect the ability to deliver to Volvo's customers. The **physical distance and localization of the supplier** will for example put more requirements on the transportation system, the quality of the articles and the safety stock, and therefore did the interviewed persons consider this as an important parameter. The **quality** on the products and handled information within the logistics system is central according to the interviewed persons. Poor quality on articles will, for example, put requirements on the supplier's capacity to make replace-articles and also the levels in the stock are affected. How flexible the logistics system is, for example the ability to fast change to increased volumes, is an important factor for Volvo, i.e. the **flexibility**. If Volvo's suppliers do not use the special Volvo **packages** it will cause extra costs for Volvo and it is therefore central for Volvo to take packages into consideration when dealing with the logistics system. **Planning and steering** the activities in the logistics system is important for Volvo, and this is a lot dependent of correct input in the system. The planning and steering secure the deliveries and internal capacity and will affect the delivery-quantities and delivery-frequencies and with that the cost for transportation and stock. The **correct input** is, according to Volvo, both correct data in the systems and written and spoken communication. Correct input is according to the interviewed persons fundamental to be able to measure and develop all the other important parameters mentioned above in the logistics system, and also to be able to design correct forecasts.

According to the respondents most of the above mentioned parameters should also be considered when taking sourcing decisions, but all of the parameters are not taken in consideration today when taking sourcing decisions. Historically, Volvo has not regarded logistics aspects when it comes to sourcing decisions in large extension. But the company has learned from experience that the logistics will affect the results of the entire outsourcing and that logistics should be a part of the sourcing decision. Volvo is therefore working on a sourcing model which also includes the logistics aspects.

There is a lack of methods for designing efficient logistics and therefore Volvo does not have sufficient methods for working with efficient logistics. This arises when looking on the whole logistics system as a total system, according to the interviewed persons.

A problem in a supplier's production can lead to expensive logistics, especially if the supplier is located far away. Volvo has experienced some cases when a supplier localized far away has had quality problems. This resulted in extra transportations for the material, which cost a lot of money but also to increased lead time and less flexibility. The transportation cost has however been paid by the supplier, but in one way or another Volvo will be affected by that cost.

Another thing Volvo is working with is collaboration in networks and arenas; both internal and external for example with other Volvo companies, academy, other external companies, suppliers and local authority. This is made to be able to develop the logistics within Volvo through for example external input and sharing ideas with other persons and companies.

Volvo thinks it is significant to work cross-functional within logistics and sourcing. It is also significant that these two areas are brought up to a high management level, to get the whole picture of the total system and have a good connection to the production- and business strategy.

6. CONCLUSIONS

The objective of this paper was to present a number of parameters which affect the efficiency of logistics and if they should be regarded when taking sourcing decisions. The case study indicates that it is an important question what affects the efficiency of the logistics and which parameters should be considered when taking sourcing decisions.

The case study indicates that it is essential to have correct input and data in the logistics systems, as for example correct forecast in to the system and also reliable and long-term plans out from the company. Therefore the authors believe correct input is a fundamental parameter, to be able to reach efficient logistics and good sourcing relations. If the company does not have correct input there will be errors and unnecessary uncertainties in the system, which lead to inefficient logistics. When you have correct input there are some parameters that are important to follow up, measure and develop to reach efficient logistics, according to the case study.

During the case study, a number of important parameters were found which affect the efficiency of logistics at Volvo. These parameters are shown in table 1 below and also an analysis of the connection to the competitive priorities, described in the theory chapter, is shown in the table.

Table 1. *Important parameters influencing the efficiency in the logistics system, with connection to the competitive priorities, and also if they should be regarded at sourcing decisions.*

| Parameters | Competitive Priority | Regarded at sourcing decision? |
|--|---------------------------------------|--------------------------------|
| Delivery capacity | Delivery | Yes |
| Delivery dependability | Delivery | Yes |
| Capacity and correct technical equipment at the supplier | Delivery | Yes |
| Total cost | Cost | Yes |
| Quality | Quality | Yes |
| Cost for transportation | Cost | Yes |
| Physical distance and localization of the supplier | Cost/ Delivery/ Flexibility | Yes |
| Flexibility | Flexibility | Yes |
| Planning and steering | Delivery | Yes |
| Package | Cost | No |
| Correct input | Can affect all competitive priorities | No |

Table 1 also show if these parameters should be regarded or not regarded when taking sourcing decision, according to the case study. The competitive priorities should, according to Volvo, not be affected negatively by the sourcing decision, and it is therefore important to consider the logistics and the connected competitive priorities at sourcing decisions. This is probably also valid for most other companies, since these are general measurable parameters.

One parameter which is central for the efficiency of the logistics, but does not has to be regarded at sourcing decision, at Volvo, is the package. The package does more affect the efficiency and cost in the logistics system than the sourcing decision.

In the theory chapter some logistics parameters are mentioned that should be regarded when dealing with sourcing decisions, and these are delivery, total cost, transportation cost, transportations time

and flexibility. The case study confirms these parameters and indicates that there are some more parameters that should be considered, for example capacity and correct technical equipment at the supplier, quality and planning and steering.

According to Mattsson (2002c) there is an inner and an outer efficiency, where the inner efficiency is mostly tied up capital and costs and the outer efficiency is mostly delivery time, delivery capacity and flexibility. Mattsson's theory shows that it is important to look at the whole chain of logistics when you talk about efficiency of logistics. The results from the case study confirm the theory from Mattsson (2002c). For example the case study has resulted in parameters covering the whole logistics systems, which means it is significant not to focus on sub parts in the system. The focus should, for example, not only be on the internal logistics, instead the focus should be on the total cost and the total system must be considered.

Outsourcing has during the last decades become a more commonly used strategy to increase profitability and competitive priorities. The case study however, indicates that outsourcing almost always leads to more complex logistics which has a negative impact on e.g. cost, lead time and flexibility. To overcome this it is important to focus on the logistics to make it more efficient in spite of outsourcing and this is a distinct result from the case study, which shows that most of the significant logistics parameters should be regarded before taking sourcing decisions. That logistics questions seldom are considered when taking sourcing decisions are also confirmed in the theory by e.g. Mattsson, 2002a.

The present situation at Volvo indicates that there are many topics which are connected to the management of the company. This is also mentioned by Storhagen (2003) who writes that the logistic concept, including sourcing, does concern more and more strategically questions. *Structural questions are strategically and businesslike decisive*. The management influence has therefore increased and the logistics questions are now on a higher management level in the companies.

According to Storhagen (2003) we can achieve more together than individual and this confirm the result from the case study, that collaboration develop the logistics within the companies. Collaborators can for example be suppliers, academy, other companies and local authority.

The case study is performed at Volvo and the parameters are representative at Volvo and their situation. Volvo is a representative company for the mechanical industry and the situation Volvo is in is

not unique of any kind. Therefore the result should be able to be valid also at other companies in the mechanical industry. However it is very important to pay attention to the present situation at the company when deciding which parameters are significant to consider. Every company and situation is in one way or another unique.

7. FUTURE RESEARCH

Outsourcing leads to increased collaboration between companies and that is an central area for future research. Since the logistics has a great impact on sourcing decision companies should take logistics aspect into consideration before making a sourcing decision. A model for rightsourcing decision which includes logistics aspect is therefore an interesting area for future research.

The case study also indicates that it is an significant question what affects the efficiency of the logistics. To answer this question it is significant to discuss what efficient logistics is and develop a model for designing efficient logistics. One way of reaching efficient logistics might be to collaborate and this is also an interesting area for future research.

An important question for future research is also to discuss how the parameters from the case study in this paper should be valued when used in a model.

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