DEPARTMENT OF TECHNOLOGY AND BUILT ENVIRONMENT

A new approach for analyzing the RL competence in 3PLs
-A case study of FLB

Sen Yang 870811-2878
Songyang Gao 860630-7034

January 14, 2010

Master’s Thesis in Logistics

The Master Programme in Logistics Innovation and Management
Supervisor: Kaisu Sammalisto
Abstract

Purpose – The purpose of our thesis is to introduce a new approach to help small and medium third party logistics service providers (3PLs) to develop and improve their Reverse logistics.

Design/methodology/approach – A case study was adopted, and a qualitative questionnaire and face-to-face interview were used to collect the fundamental data. In addition, the multi-criteria decision-making tool-AHP and the Reverse Logistics audit model were used to analyze the case and to solve the problem of 3PLs in Reverse Logistics improvement.

Findings – Under the fierce competition and in today’s volatile market, the Reverse Logistics is considered as a new competitive advantage to many 3PLs. However, the effective solutions in instructing 3PLs how to develop and improve their Reverse Logistics competence are still very scarce. Based on these, a new approach will be presented in this thesis to help 3PLs to solve problem.

Limitations – There are two main limitations in our paper, which emerge in the two models we adopted. Regarding the Reverse Logistics audit model, we need more data of the case company to support our research. For the AHP method, the limitation is: the fact that general assumptions were used to provide correlative data in computation, and complex computation was simplified in order to show calculative processes clearly.

Practical implications – FLB, the case company will be researched to verify the practical implication of our new approach. We believe through our approach, lots of small and medium size 3PLs will find it easier to get a holistic view of their RL competence, and know how to develop or improve it.

Originality/value – How to evaluate and assess the RL competence will be presented separately from inside view of 3PLs and outside view of their customers. AHP and self-made RL audit model will be used to achieve then respectively.

Keywords Reverse logistics, Analytic hierarchy process, Assessment tool, and 3PLs

Paper type Case study/ Research paper
Abbreviation

RL - Reverse Logistics
3PL – Third Party Logistics
3PLs - Third Party Logistics Service Provider
3PRLP - Third Party Reverse Logistics Provider
CRC - Centralized Return Centers
AHP - Analytic Hierarchy Process
PV - Priority Vector
CI - Consistency Index
CR - Consistency Ratio
$\lambda_{\text{max}}$ - The biggest eigenvector
RCI - Random Consistency Index

The seven attributes:

3PLS - Third party logistics services
OPC - Organizational performance criteria
OR - Organizational role
US - User satisfaction
IT - IT application
IU3PL - Impact of use of 3PL
RLFs - Reverse logistics functions
# Table of Content

1. Introduction ..................................................................................................................1
   1.1 Background .............................................................................................................1
   1.2 Literature review ...................................................................................................2
   1.3 Purpose ....................................................................................................................4
   1.4 Research question .................................................................................................4
   1.5 Methodology .........................................................................................................4
   1.6 Limitation ...............................................................................................................5
2. Theoretical framework ..................................................................................................5
   2.1 The flow of the reverse logistics activities .........................................................5
   2.2 The AHP method and the attributes and sub-attributes .....................................7
   2.3 The Continue Innovation Audit tool .................................................................11
   2.4 The Reverse Logistics audit model .....................................................................12
   2.5 The combination of the theory framework .......................................................15
3 Empirical Studies ..........................................................................................................16
   3.1 FLB background ...................................................................................................16
   3.2 The results of Interview .......................................................................................17
   3.3 Finding ..................................................................................................................19
      3.31 The Reverse Logistics audit model .................................................................19
      3.32 AHP and the attributes ..................................................................................20
4. Discussion .......................................................................................................................23
   4.1 The RL audit model ..............................................................................................23
   4.2 AHP method ..........................................................................................................26
   4.3 The new approach ..................................................................................................26
5. Conclusion ......................................................................................................................27
6. Further research .............................................................................................................28
7. Reference .......................................................................................................................29
8. Appendix 1 ....................................................................................................................32
9. Appendix 2 ....................................................................................................................35
1. Introduction

1.1 Background

The reverse logistics is a new flow different from the original forward logistics, and reverse logistics can be defined as the reverse process of logistics (Luttwak, 1971). Schatteman, O. (2003) thought the economic demand for reverse logistics capabilities is driven by two different factors. First, companies are starting to realize the economic value of sound returns management. As a system, the reverse logistics can ensure the materials can be possible reused and recycled, in order to increase the company’s profitability. Secondly, legal environmental developments are requiring manufacturers to be fully responsible for products over their entire life cycle. Reverse logistics systems are necessary for a complete environmental program. However, in the past, many companies hesitate to spend money on an environmental program without a financial benefit (Bloomberg, D.J. et al, 2002). That’s the one reason why the reverse logistics can be hardly developed and widely implemented all over the world.

In recent years, with the gradual development of circular economy concept, people’s awareness on environmental protection is continuously increasing. Companies more and more consider environmental aspects in their decision-making driven by environmental policies and relevant laws. European firms are required by law to take back transport packaging used for their products in order to reduce costs, firms attempt to reuse as much of these materials as possible, and reclaim the materials when they can no longer be reused (Roger, S. D. and Tibben-Lembke, S. R., 1998)). This makes the status of Reverse Logistics is becoming crucial in enterprise management’s strategy. The development of reverse logistics is closely related to the growing interest in, and important of, the environment impact, especially in Sweden (Enarsson, L., 2006). Enterprises have recognized that a reasonable Reverse Logistics decision-making can not only enhance the reputation of the company but also is filled with a rich space for economic development. In this case, there are plenty of organizations which are trying to built or outsource reverse logistics system in order to balance their profit and environment performance. However, the cost control is the most intractable problem in the stream of Reverse Logistics management practice. Guo, T. and Li, X. (2008) argued that the United States through many years of experience has gradually reduced the cost of reverse logistics to around 4% of the total cost of logistics. But the prerequisite is a third-party reverse logistics service provider which can make the effective management and disposal for 80% to 90% of all returned products from the retail industry. But the provider ought to be able to optimize the processes and information systems of reverse logistics within the enterprise. Companies which purchase reverse logistics assistance from third-party
providers could reduce up to 10% of their company’s annual logistics costs (Minahan, T., 1998). As we can see that choosing an excellent third party reverse logistics provider undoubtedly is one of the ways to reduce the reverse logistics costs and to improve the performance of reverse logistics.

If you want an excellent third party reverse logistics provider as your partner in the reverse logistics process, it’s necessary to know the criteria for the best third party reverse logistics provider (3PRLP). A structured model for evaluating and selecting the best 3PRLP was showed by Kannan G. (2008). It encourages the top-level management to outsource their reverse logistics instead of building their own process for collecting the returned products. Kannan G. (2008) defined the term named 3PRLP: “The 3PRLP will collect the returned products, inspect them and categorize them according to the various reverse logistics operations.” A survey made by Knemeyer et al. (2002) indicated that 80 out of the top 100 3PL providers currently offer reverse logistics services and the CEOs of 3PL providers recognize and emphasize opportunities in reverse logistics. Therefore, we can tell that reverse logistics is becoming a core competence among today’s 3PL providers. However, being a 3PRLP, it’s better to understand what the current customers’ needs and what kind of a 3PRLP is the best one in their angle, and to know how to make the reverse logistics service as your competitive strength regards to other providers in the market.

However, the problem is that many third-party providers are eager to enter the reverse logistics service market, but without the knowledge of reverse logistics, they are not prepared to effectively address these service needs in the RL market (Dowlatshahi, 2000). Our study mainly introduced a new approach to help small and medium Third party logistics service provider (3PLs) to improve their Reverse logistics performance in today’s market.

As a result, in our paper, we do not talk about how to choose a 3PRLP, instead we address on how a small or medium 3PRLP ought to develop and optimize their service in Reverse Logistics from the customers’ view. Through a case study—FLB (a Swedish Third Party Logistics company located in Gävle) to illustrate all this. This paper presents an audit model (Tidd, J. and Bessant, J., 2005) modified by the authors, which is used to measure and analyze FLB’s Reverse logistics competence from five aspects: Services, Innovation, Flow, Information and Resource commitment. After evaluating the FLB’s competence in reverse logistic, the discussion part shows how a medium 3PRLP like FLB can improve and optimize themselves in the field of reverse logistics. Results and conclusion will be provided at the end.

1.2 Literature review

In today’s highly competitive environment, many global companies are cooperating among different countries. They are aiming to gain a share of the global market and to
take advantage of higher production and sourcing efficiencies. Therefore, more and more pressures have been placed into the Logistics activities. How to quickly and exactly deliver customer adapted products all over the world has been the biggest challenge to a firm. According to this, establish an effective logistics system has become more prominent and is recognized as a critical factor in competitive advantage (Bowersox and Closs, 1996; Bowersox and Daugherty, 1995). However lots of in-house logistics system operations have been proved unsuccessful and costly, because they realize they lack the core knowledge and competencies to operate them (Sink and Langely, 1997). As a result of this, outsourcing logistics activities to a third-party provider have been considered as a strategic thinking in many companies. Roberts (1994) reported that customers of 3PLs place significant value on the services they provide, the quality of people they have and low cost they spend. In here the services are seeing as the most significant reason the 3PLs be selected. In recent years, except the transportation and warehousing services, more 3PLs were extending their service portfolio. The new service will be more complex than ever before and serving more customers than previously (Lieb and Kendrick, 2003; Lieb and Bentz, 2004). For instance, implementing and merging with the system have enabled the 3PL to perform more helpful services, such as regulatory compliance and determining the total delivered cost of goods for sale. Nearly 75 percent of the Fortune 500 Companies now rely on 3PLs to support their supply chains, increasing the 3PL’s revenue to nearly double since 1996 (Trebilcock, 2002).

A real successful company is highly dependent on its ability to achieve effective integration of worldwide organizational relationships within a supply chain (Shepherd and Gunter, 2006; Drucker, 1998). In recent years, lots of companies have found that just to rely on 3PLs in the forward logistics flows of Supply Chain is not enough, because the pressures are not only from how to fulfill the orders made by customers on time, but also from how to retrieve the return products from them in the selling point. They realized they should integrate the forward and backward logistics flows in the Supply Chain. Regarding to this, the works of backward logistics flows and logistics Supply Chain integrated management have become the new challenge or opportunity to most 3PLs companies.

When we talk about the backward logistics flow of Supply Chain, the Reverse logistics will be the first service reflecting into our mind. Regarding to the reverse logistics, there are lots of different descriptions. Reverse logistics involves product returns, source reduction, recycling, materials substitution, reuse of materials, waste disposal, and refurbishing, repair, and remanufacturing (Stock, 1998). Schwartz (2000), Rogers and Tibben Lembke (2001) state that every reverse logistics system should include the gate keeping, collection, sorting and disposal function. So we can think the reverse logistics is a process which helps the company to retrieve the returned products and to dispose them in different ways.

In the recent study, reverse logistics is viewed as one of the 21 top warehousing trends
in the twenty-first century (Brockmann, 1999). Reverse logistics is increasingly becoming an area of organizational competitive advantage, making the pursuit of this function a strategic decision (Schwartz, 2000). From the result of the logistics service survey made in American in 2004, we can discover and get verification to these trends and perspectives. From 2001 to 2004, the percentages of customer using frequent logistics services from 3PLs are showing a decrease, only the reverse logistics (from 26 to 33) service and few others show an increase (Lieb, et al., 2004). So no doubt the reverse logistics service has been much addressed by the 3PLs in nowadays.

Many firms have relied upon 3PL providers for years, but the reliance on 3PL providers for reverse logistics activities is fairly new (Bloomberg et al., 2002). When facing the fierce competition and increasing customers’ demand in reverse logistics, all 3PLs should think about which kind of logistics service providers they want to be. We believe the reverse logistics service could be the future for some 3PLs, this is a rather new field, but we also found there are few researches working on it now, so the lack of theories supporting in management make lots of 3PLs to fear to implement RL. According to these, we get an inspiration to do some further researches in it, and try to give some supports and ideas to those 3PLs who eager to enter this field.

1.3 Purpose

The purpose of our paper is to introduce a new approach to help small and medium Third party logistics service provider (3PLs) to develop and improve their Reverse logistics. How to utilize the new approach in practice is also will be researched in our thesis.

1.4 Research question

As we talked above, we know that there are many 3PLs which have a desire to enter into the RL market, but do not have the knowledge and awareness of reverse logistics. Since the theory about the management of the RL is limited and makes these 3PL providers don’t know which way to go. Due to this factor, our research question focused on how a 3PL provide needs to develop and manage their RL in order to make themselves as a real 3PRLP.

1.5 Methodology

In order to find out the interesting field in reverse logistics, a broad literature review plan was launched at very beginning. The article written by Kannan, G (2008) greatly inspired us to use the Analytic Hierarchy Process (AHP) method in our thesis. We thought the method will help 3PLs from the outside (customer) view to know: which customer is the
most appropriate one to provide RL service now and how could through improving RL competence of them to gain more customers in future. In addition, the CI audit tool made by Tidd, J. and Bessant, J. (2005) which used to evaluate the innovation competence, enlighten us to modify it to a Reverse logistic competence audit model. 3PLs could use this model to improve their RL competence.

Furthermore, in order to verify whether our approach could function in practice, a case study research was implemented. Because our purpose is to help small and midsize 3PLs to improve their Reverse logistics, the FLB – a small and midsize 3PLs in Sweden was selected. At the beginning of the case study, we used the qualitative way to collect correlative data. A questionnaire (appendix 2) relating the RL competence was sent to the manager in FLB. We want to through the answers to detect the thinking of RL from the manager in our case. In order to verify the answer in the questionnaire and exploit more information directly during conversation, a face to face interview was taken place after questionnaire.

In order to comprehend and get a better auditing about FLB’s RL competence, we sent our interview questions to their logistics manager at very first and asked for her answers. At once we got the answers, we read them very carefully, and marked the unclear ones out and changed the questions which made misunderstanding. After we done these, we made a face to face interview to their manager again, trying to confirm every answers and get a better understanding. Following are the summery of the answer and interview.

1.6 Limitation

There are two main limitations in our paper, which emerge in the two models. Regarding to the Reverse Logistics audit model, we need more data of the case company to support our research; the audit questionnaire should be developing in the future. Regarding to the AHP method, the lack of information of FLB’s main customers, the general assumption was used to provide correlative data in computation. In addition, the complex computation was simplified in order to show calculative processes clearly.

2. Theoretical framework

2.1 The flow of the reverse logistics activities

The reverse flow of a supply chain from consumer to raw material will be showed in Figure 1. It includes the general reverse logistics activities, such as old return product
test, repair, remanufacturing, recycling and disposal. As a 3PRLP, the first concern is how to help the firm to effectively and efficiently get the products back from the end users. Also, the 3PRLP have to determine the place where of each product should go. That is, for each product, they need to test the conditions of each product, thereby to decide the final destination for products inserted into the reverse logistics flow (Roger S. D. and Tibben-Lembke S. R., 1998). Firms can sell them as a reconditioned or remanufactured product to the second market by Repair or refurbishing of the products with the 3PRLP’s service. If the product cannot be reconditioned in any way, because of its poor condition, legal implications, or environmental restrictions, the firm will try to dispose of the product for the least cost (Roger S. D. and Tibben-Lembke S. R., 1998). And then, any valuable materials should be remanufactured or recycled by disassembling the products. And the useless materials need to be disposed by landfill or other techniques.

Understanding the theory of the reverse logistics flow and common activities of reverse logistics is the basic condition for us to do our research. From the aspect of the 3PRLP, we could say that in this reverse supply chain flow, the 3PRLP will play the role of reverse logistics activity provider for those companies which want to outsource their reverse logistics system partly or entirely. The following two theories are based on this reverse flow and those activities.

![Flow diagram of reverse logistics activities](image)

**Figure 1**, Flow diagram of reverse logistics activities,

2.2 The AHP method and the attributes and sub-attributes

AHP method
The Analytic Hierarchy Process is a structured technique for dealing with complex decisions and it provides a fundamental scale of relative magnitudes expressed in dominance units to represent judgments in the form of paired comparisons (Saaty T.L., 1990). Based on mathematics and human psychology, it was developed by Saaty T. L. in the 1970s and has been extensively studied and refined since then (Bhushan, N. and Kanwal, R., 2004).

Basically, it can be summarized so that there are four steps in AHP method, and the first one is Decomposing. In this step, the problem is decomposed into attributes (which are grouped on different levels to form a chain of hierarchy, simply show in Figure 2). Each attribute is further decomposed into Sub-attributes/Alternatives until the lowest level of the hierarchy (Zahedi, 1986; Saaty, 2000).

![Figure 2 A simple AHP hierarchies](image)

The second step is called weighing. This step is about giving the scale of preference for each two of the attributes and sub-attributes by using a rating scale (table 1).
Table 1 Scale of preference between two attributes


But how to get the weight of each attribute? Here is a way to calculate the weight in the Evaluating step. An assumption is that if the decision maker thinks the importance of attribute A is Very Strongly than attribute B, it is rated at 7. On the contrary, attribute B must be much less important than A, so it is valued at 1/7(Figure 3). These paired comparisons are carried out for all factors to be considered.

![Figure 3 Scale of preference between A and B](image)

Next, we sum up the numbers of each column and make each of the scale of preference divided by the sum of its column. You have to add up the result numbers of lines and divided it by the matrix of order \( n \). Then you get the weight of each attribute—PV (Priority Vector), see table 2.1, the figure between brackets shows the weight of each attribute.
A

About the weight of each attribute regards to the alternative, we use the same way to calculate the PV for every alternatives (Table 2.2 and Table 2.3).

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>PV (Priority Vector)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1 (0.875)</td>
<td>7 (0.875)</td>
<td>0.875</td>
</tr>
<tr>
<td>B</td>
<td>1/7 (0.125)</td>
<td>1 (0.125)</td>
<td>0.125</td>
</tr>
<tr>
<td></td>
<td>1.143</td>
<td>8</td>
<td></td>
</tr>
</tbody>
</table>

Table 2.1 a matrix example of the weight of attributes regards to the goal

We have to calculate now the overall priority for each alternative solution by the formula:

\[
\text{Weight of the attribute regards to the goal} \times \text{Weight of the attribute regards to alternatives} = \text{Priority}
\]

The overall priority of one alternative solution is the sum of each priority of the attributes for this alternative. So the alternative 1’s overall priority for the goal is:

\[
0.875 \times 0.2 + 0.125 \times 0.33 = 0.217;
\]

The alternative 2’s overall priority is:

\[
0.875 \times 0.8 + 0.125 \times 0.67 = 0.783;
\]

The next step is Selecting phase, from the step 3 we can get the overall priority for each alternative, and the best choice is the alternative which has the largest overall priority value.

The final stage is to measure how consistent the judgments have been relative to large samples of purely random judgments (Coyle, G., 2004). Suggested by Saaty that the consistency index CI (consistency index) = \( \frac{\lambda_{\text{max}} - n}{n - 1} \) to test the consistency of the intuitive judgment. In general, if a value of CI is less than 0.1, it is satisfactory (Saaty 1977; 1980). But he modified this approach in 2000 by introducing the term CR (consistency ratio) which is calculated in the way as following:

Step 1: Calculate the biggest eigenvector (\( \lambda_{\text{max}} \)). The formula is to multiply the sum of
each row by the PV of each column.

Step 2: Compute the CI for each matrix of order n by the formula:

\[ CI = \left( \lambda_{\text{max}} - n \right) / (n - 1) \]

Step 3: The CR is then calculated using the formula:

\[ CR = CI / RCI \]

Random consistency index (RCI) is a term known as random consistency index obtained from a large number of simulations runs and varies depending upon the order of matrix (Kannan G., 2008). Table 3 shows the value of the RCI for matrices of order 1-10 obtained by approximating random indices using a sample size of 500 (Saaty, 2000).

<table>
<thead>
<tr>
<th>n</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>RI</td>
<td>0</td>
<td>0</td>
<td>0.58</td>
<td>0.9</td>
<td>1.12</td>
<td>1.24</td>
<td>1.32</td>
<td>1.41</td>
<td>1.45</td>
<td>1.49</td>
</tr>
</tbody>
</table>

Table 3 Random consistency index from 1-10.
Source: Saaty (2000)

If the value of CR is equal to, or less than that value, it implies that the evaluation within the matrix is acceptable. If CR is more than the acceptable value, inconsistency of judgments within that matrix has occurred and the evaluation process should therefore be reviewed, reconsidered and improved (Crowe et al., 1998).

**The attributes and sub-attributes for selecting the best 3PRLP**

Based on literature review in his paper, Kannan G. (2008) presented a structured model for evaluating the usability of the 3PRLPs that links with operational characteristics in the selection criteria of 3PRLP, relevance in logistics outsourcing and the references in detail (see Appendix 1). But in order to help the decision-makers to reduce the time spend on the pair-wise comparison (one of the AHP steps is to measure the importance of each element) to evaluate the alternatives, 7 attributes and 34 sub-attributes have been chosen from the attributes of selection criteria of a 3PRLP by conducting a survey from the company experts. As the table 4 shows, the seven attributes are: third party logistics services(3PLS), organizational performance criteria (OPC), organizational role (OR), user satisfaction (US), IT application(IT), impact of use of 3PL (IU3PL) and reverse logistics functions (RLFs).
The attributes and sub-attributes for selecting the best 3PRLP

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Sub-attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Third party logistics services (3PLS)</td>
<td>Inventory replenishment (3PLS1)</td>
</tr>
<tr>
<td></td>
<td>Warehouse management (3PLS2)</td>
</tr>
<tr>
<td></td>
<td>Shipment consolidation (3PLS3)</td>
</tr>
<tr>
<td>RLFs</td>
<td>Carrier selection (3PLS4)</td>
</tr>
<tr>
<td></td>
<td>Direct transportation services (3PLS5)</td>
</tr>
<tr>
<td>OR</td>
<td>Collection (RLF1)</td>
</tr>
<tr>
<td></td>
<td>Packing (RLF2)</td>
</tr>
<tr>
<td></td>
<td>Storage (RLF3)</td>
</tr>
<tr>
<td></td>
<td>Sorting (RLF4)</td>
</tr>
<tr>
<td></td>
<td>Transactional processing (RLF5)</td>
</tr>
<tr>
<td></td>
<td>Delivery (RLF6)</td>
</tr>
<tr>
<td></td>
<td>Reclalm (OR1)</td>
</tr>
<tr>
<td></td>
<td>Recycle (OR2)</td>
</tr>
<tr>
<td></td>
<td>Remanufacture (OR3)</td>
</tr>
<tr>
<td></td>
<td>Re-use (OR3)</td>
</tr>
<tr>
<td></td>
<td>Disposal (OR5)</td>
</tr>
<tr>
<td>US</td>
<td>Effective communication (US1)</td>
</tr>
<tr>
<td></td>
<td>Service improvement (US2)</td>
</tr>
<tr>
<td></td>
<td>Cost saving (US3)</td>
</tr>
<tr>
<td>IU3PL</td>
<td>Overall working relations (US4)</td>
</tr>
<tr>
<td></td>
<td>Customer satisfaction (IU3PL1)</td>
</tr>
<tr>
<td></td>
<td>Frequently updating (IU3PL2)</td>
</tr>
<tr>
<td></td>
<td>Profitability (IU3PL3)</td>
</tr>
<tr>
<td></td>
<td>Employee morale (IU3PL4)</td>
</tr>
<tr>
<td>OPC</td>
<td>Quality (OPC1)</td>
</tr>
<tr>
<td></td>
<td>Cost (OPC2)</td>
</tr>
<tr>
<td></td>
<td>Time (OPC3)</td>
</tr>
<tr>
<td></td>
<td>Flexibility (OPC4)</td>
</tr>
<tr>
<td>IT applications (IT)</td>
<td>Customer satisfaction (OPC5)</td>
</tr>
<tr>
<td></td>
<td>Warehouse management (IT1)</td>
</tr>
<tr>
<td></td>
<td>Order management (IT2)</td>
</tr>
<tr>
<td></td>
<td>Supply chain planning (IT3)</td>
</tr>
<tr>
<td></td>
<td>Shipment and tracking (IT4)</td>
</tr>
<tr>
<td></td>
<td>Freight payment (IT5)</td>
</tr>
</tbody>
</table>

Table 4 The attributes and sub-attributes for selecting the best 3PRLP

Source: Kannan G. (2008)

The original thought of Kannan G. (2008) was to select a 3PRLP by using the multi-criteria decision making (MCDM) tools such as AHP and FAHP to evaluate and rank the various alternatives according to the 7 attributes and 34 sub-attributes. However, after understanding what the criteria to select a 3PRLP are and what the different customers’ needs, we decided to invert this process to see whether or not a 3PRLP can satisfy their customers by considering the 7 attributes and 34 sub-attributes, and what should they do to fulfill the demands of their customers.

2.3 The Continue Innovation Audit tool

A Continue Innovation audit tool was made by Tidd, J. and Bessant, J. (2005) to analyze and to assess ‘how well do we manage innovation’ by ourselves through 40 questions. For each question, you can put a number from 1 to 7 which represent the different level
that you agreed on the statement in this organization. All the questions are about the five dimensions in the organization respectively which are strategy, learning, linkages, processes and innovation. When you have finished the questions, you can calculate the total in a certain way, and at last, you can plot a profile for the five dimensions according to the totals you have accounted (Figure 4). Finally you can make out the weakness and strong side of the organization in CI capability.

![Figure 4](image)

**Figure 4** Continue Innovation audit tool.

**Source:** Tidd, J. and Bessant, J. 2005

We are very inspired by Tidd’s simple self-assessment tool. It focuses on some of the important areas of innovation management, and dramatically helps a company to realize their competence in innovation. In this tool, you will find some statements which describe ‘the way we do things around here’ – the pattern of behavior which describes how the organization handles the issue of innovation. For each statement simply put a score between 1 (= not true at all) to 7 (=very true). After you answered these questions, next step is relating these answers to scores (give scores to each answer). Furthermore, we need filling the answers’ scores into a special form. Since there are 8 questions for each dimension, we need sum up these 8 questions’ scores first and then divided 8. Finally, we will get an average from each dimension. Accordingly, a shape about the competence of innovation will get.

### 2.4 The Reverse Logistics audit model

So far, it is hard to find out some particular articles which contribute to how to assess the RL competence of 3PLs. Lots of contemporary investigation focus on the management of effective reverse logistics, the integration of RL into the whole supply chain and the RL deposition strategies (Skinner, R. L. et.al, 2008). According to this, we researched lots of books and articles about RL, we modified Tidd’s model to the
RL audit model (figure 5) by changing the five dimensions to: Services, Flow, Information, Resources commitment and Innovation. By using this RL audit model, 3PLs can easily get a holistic view of their RL competence. Below, we will explain these dimensions one by one and exhibit the articles that support us to structure them.

**Figure 5** The model for auditing Reverse Logistics competence of 3PLs.

**Services**
The use of the 3PLs to provide the logistics service was called-Logistics Outsourcing, which is “the decision to use independent, external organizations as the means of accomplishing some, or all, or the logistics related functions within the firm.” (Sheffi, Y., 1990). However lots of the services only include materials handling for just-in-time production, transportation, and warehousing. Recently, the environmental concerns have forced many firms to ask 3PLs to provide reverse logistics services. In order to show expenditure in 3PLs’ services are more and more important in nowadays, three trends in the RL service were mentioned by Bloomberg, D.J. et.al. (2002). The first trend is customers now are not just satisfied with the traditional logistics services, they are more thinking about the value services in RL, and for example, they are considering picking up the garbage from a private company and disposing them. The second is the clients now need more customize services to fulfill their special requirement. They were specializing in such operations will most likely move hazardous waste or other unique products requiring RL services. The last one is some 3PLs realize they cannot offer their customers every possible services, so cooperating with their alliances to all round services, share risks and resources are very urgent. Furthermore, logistics alliances allow each firm to concentrate on their core competencies, while also allows customers to purchase multiple logistics services through a cohesive alliance. In this dimension, the ways to dispose the returned products should be seen as RL service also, for instance Landfill, scrap and resell.
According to perspectives above, we think Services should be one of the dimensions in assessing the RL competence of 3PLs. It shows how good and rich RL services they could provide.

Flow
In lots of authors’ perspective, the flow of the RL is the underlying and critical part of the companies that want to implement the RL within their organization. Meade, L. and Joseph, S. (2002) combined the operational lifecycle of product and reverse logistics function to research where the RL should be located. They think reduction of the waste and safe costs in recycle during production are the main goals of RL. We know there is a main problem in reverse flow: it is all the waste cannot be immediately recycled, reused, remanufactured and disposed of. So an effective logistics flow becomes very important in RL. The RL flow must could quick and accurate retrieve the returned product from the difference place of product’s lifecycle, for example: Procurement, Production and Distribution.

To integrate the forward and backward flow is very difficult too. Some researchers said that cycle time processing is negatively affected when one distribution center handles both forward and reverse shipments (Roger S. D. and Tibben-Lembke S. R., 1998). Maybe a logistics company can do well in their forward flow, but when facing the reverse flow, they usually stick in the mud. So we took the Flow of RL into one dimension of our model, in order to get a holistic view of the RL competence of a 3PLs.

Information
When we talking the information, the information systems are the prominent issue we usually bring out. In order to operate reverse logistics in a better way, firms must improve their reverse logistics information systems. In the beginning of RL business, most return processes are paper-intensive. These induce that many problems will emerge in RL process. Nowadays, when the net technology is wildly used, some simple information system was introduced into RL. However in order to work well, flexibility is another big problem (Roger S. D. and Tibben-Lembke S. R., 1998). In order to solve the problem in flexibility, the technologies application is more and more important, what will greatly increase the efficiency of RL information system, for instance: POS (Point of sale) registration, RFID (Radio Frequency Identification) and Two-Dimensional Bar Coding. Now, not only the RL service providers want to know the return information, but also the customers. So we think customer friendly is also one of the crucial functions when firms make the designing of RL information system. All the evidences above drive us to make the Information as one of the dimensions.

Resource commitment and Innovation
We think resource commitment and innovation should be two different dimensions in
our paper, because some researches state that resource commitment was not found to be significantly related to innovation in reverse logistics at smaller firms (Richey, R.G., et.al. 2005).

Resource commitment to RL should be a priority, because of the potential for enhancing performance and because development of reverse logistics offers a strategic way of developing lasting linkages with customers (Tan et al., 2003). Resources will commit to the success of RL was said by Das and Teng (2000), they suggested that three types of resource commitment will greatly enhance the RL performance, they are financial resources, technological resources, and managerial resources. However, when we were writing the questions of the model, we thought the human resource should be one type of them. Human beings as workers were regarded as the basis cell of firm, everything they do will influence the firm’s development.

Innovation, the seeking of creative, unusual, or novel solutions to problems or needs (Morris and Sexton, 1996), is especially important for reverse logistics, because standard distribution systems typically will not “stretch” to cover retrieval of products adequately. Different, ideally innovative, approaches are needed for returns handling. In addition, compared to traditional logistics nowadays, the activities in RL are frequently changing and hard to predict. So the occasional innovation in few projects is not enough now. According to this, lots of RL managers will improve their capability in innovation which can supports them to fix those emergency problems. In order to get a holistic view of the RL competence of a 3PLs, we think the innovation should be added to be one of our evaluative aspects.

2.5 The combination of the theory framework

Combined the theories and models which are presented above, we created the holistic theoretical framework that run through our paper (Figure 6). As we said above, the basic requirement for our research is the understanding of the context and details about the activities in the reverse logistics. Making the routine RL activities as the research background, we structured an audit model to evaluate the RL capability in the case company (FLB) from five dimensions which we elaborated above. After finding their capability in RL according to questionnaire, interview and RL audit tool empirical findings in the case company (inside view), there will be a graph to show their weakness and strength side in RL capability. Meanwhile, this model allows us to better understand the environment of this 3PRLP, and makes it easier for us to investigate this company from the outside.

On the other hand, we investigated the criteria for selecting the best 3PRLP in seven main attributes and 34 sub-attributes from the angle of the customers (outside view). The fundamental object of a 3PRLP is to satisfy their customs’ requests and requirements in RL services. Therefore, it is rather important to see whether or not a 3PRLP can fulfill the demands of their different customers. From this outside point of
view, we inspect how FLB can satisfy their customers from the seven main attributes: third party logistics services (3PLS), organizational performance criteria (OPC), organizational role (OR), user satisfaction (US), IT application (IT), impact of use of 3PL (IU3PL) and reverse logistics functions (RLFs). And 34 sub-attributes which are showed in the appendix 1.

**Figure 6** Overall theoretical frameworks in our paper.

As a result, the overall theoretical framework has been created by authors for conceptualizing the findings from outside and inside of the 3PRLP (FLB), as well as explaining how the results and conclusion of our research come out.

### 3 Empirical Studies

#### 3.1 FLB background

FLB was founded in 1987 and is situated in Gävle, Sweden. It is a growing third party logistics company focusing on the telecom- and electronic-industry sector. Their main customer is Ericsson in Gävle and their suppliers. Their Basic Services include Transports (local, national, international), Inbound Handling, Storing, Outbound Handling, Bonded Warehouse and Customs Administration, Stock and transaction Reports as well. Furthermore, they also supply Value add services such as: Production, Quality support Logistics support and Reversed Logistics. FLB as ‘a positive and
developing link’ to help their customers to eliminate inefficiencies and minimize tied-up capital so that they can maintain an efficient supply chain (FLB website, 2009).

3.2 The results of Interview

Services
From the manager’s answers, we know FLB does not influence the return or recycle packaging today, all the package designed is owned by customer. Now they are providing the RL services like Inbound handling of returned units, First visual (to make a visual to find out whether there are huge damage to the returned product), Functional test, Take photos of the broken parts and communicate with customer. But they always await further instruction from the customer. Upon the customers’ request, they dispose their products and packing material, mainly is carton boxes and different plastic material. By the way they also dismantle the product to pace and send to recycling companies. They do not have any unique technology to deal with their customers’ returned products. They cooperate with some other company to dispose returned products, e.g. Stena Recycling- helping to dismantle units and NEFAB Pool-dealing with packing material. Because FLB just share several parts of their customer’s RL, they just feel they have satisfied them, but have not asked to their customers.

Flow
They do not have a real “Gatekeeper” (the process to verify whether the returned products should go inside the reverse flow), they just match the returned products to the list they customer instruct them. They are just located in one city, on two locations, so they think they do not need the Centralized Return Centers (CRC) to help them distribute the returned product. About their RL flow, from the examples the manager gave, we realize they receive all the returned product from their customer, some of them are pre-announced by the customer, some of them arrival with the marked information, and some of them are no any pre-announcement. The works after they received the returned product into the RL flow is not clear. They just sent the information to their customer and always await further instruction. Although they standardized their process in RL flow, but their customers are difficult to understand the stock-information stored in FLB, which make them are hard to make the decision how to dispose their returned products. In addition, they are not clear how long the RL process will take. Generally they think it will take from one day to one week, but all depend on how emergent their customers want to dispose their returned products.

Information
FLB use their own system-WMS (Warehouse Manage System) to manage their RL. However it is not exclusive system to RL. Stock and transaction reports mainly recorded in excel or PDF file. Except WMS, their Customer Login system is also dedicated to manage RL, helping customers to know their RL data by login to their
account in FLB website. However, they do not use any of the technology like: POS (Point of sale) registration, RFID (Radio Frequency Identification) and Two-Dimensional Bar coding to help them tracking the returned product. The main reason is that they do not own the whole RL process of their customer.

**Resource Commitment**

This dimension focuses on three facets: Personnel, Finance and Management. In personnel, they have little support to their employees on work of RL, what they usually do were showing what is the RL and nothing more. There are not special employees working on RL in FLB. About finance, the manager said they did not invest in RL, so compared with other service the money spend on it was very limited. The logistics manager said they were lack thinking and management in RL. They just assess or measure their own part of the customer’s RL flow, also lacking works in improving their management in there.

**Innovation**

The manager said they always hope they would have some creative activities in RL, and some innovations in developing new technology to RL which are based on their experience, but in really she could not give any examples on them. They had no specific RL training programs to their employees, but they always educated them the importance of RL and it was included in their work. Previously, they did not have any connection with university or some agencies to improve their RL capability. Now the CLIP- Center for Logistics and Innovative Production was initiated at the University of Gavle, but it does not focused on RL.

**Environment and Others**

Except for the five main dimensions in our RL audit model, we are also very interested in how FLB is thinking and doing in the environment and others relative aspects. In the environment, FLB is helping their customer to reduce environment impact by avoiding unnecessary transports, supporting in quick decision making and discussing the present amount of carbon dioxide in total. They also train their employees to set up the environment view, for example they are in the starting point to implement ISO 14000 within 12 months. FLB also give suggestions to their customers in how to dispose their environmental harmful returned products, but this is not frequently. The FLB now takes the responsibility to take back all the packaging, but they are at customers own cost.

We are also very interested about the customers’ perspective of FLB’s RL. Actually, the customers of FLB have quite different view of how much they want to handle themselves, and most of them give high attention to their RL and want to control the process. So the manager told us that among in their 12 customers, only 5 of them cooperated with them in RL. The usual two questions asked by customers about RL are: the administrative and physical handing competence. Now the only way for the customers and supplier to verify these capabilities was visit FLB and go through their
products in the RL flow (inspection, repair area).

In the end of interview, we asked the manager to make a ranking to the services they provide. The rank is from 1 to 8. 1 stand for this service is very important and should receive much more attention on, 8 is on the contrary. The result is showed in the table below. From the table 5 we found the RL just got 2 in ranking which mean it is not very important service in FLB. However, the manager also said maybe they should market more in RL, improve they capability and let the customers understand them and trust FLB could do very well in it. By the way, she also thinks RL service could be one of the core competitive advantage of 3PLs for them.

Table 5: The ranking of the important about FLB’s service

<table>
<thead>
<tr>
<th>FLB’s Services</th>
<th>Ranks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transports (local, national, and international)</td>
<td>8</td>
</tr>
<tr>
<td>Bonded Warehouse and Customs Administration</td>
<td>7</td>
</tr>
<tr>
<td>Stock and Transaction Reports</td>
<td>6</td>
</tr>
<tr>
<td>Logistics supports</td>
<td>5</td>
</tr>
<tr>
<td>Production</td>
<td>4</td>
</tr>
<tr>
<td>Quality support</td>
<td>3</td>
</tr>
<tr>
<td>Reverse logistics</td>
<td>2</td>
</tr>
<tr>
<td>Inbound/Outbound Handling and Storing</td>
<td>1</td>
</tr>
</tbody>
</table>

**Resource:** According to the interview

### 3.3 Finding

#### 3.31 The Reverse Logistics audit model

After we got the results from the interview, which we base on the Tidd’s calculation way, and try to get the data that used to draw our RL audit model. At the beginning, in order to minimize the influence by the other similar questions in same dimension, we mix all dimensions’ questions up and arrange them in a new way. Firstly, we each picked up one question from one dimension and the ranking is follow by: Services, Flow, Information, Resources commitment and Innovation. So there will be six groups and each group will have five questions from five dimensions. Secondly, we combined the six groups together and marked the new number from 1 to 30 into each front of them. (After that you would discovered the questions 1, 6, 11, 16, 21, 26 were all from services, and questions 2, 7, 12, 17, 22, 27 were from Flow). In addition, we ranged the answers of questionnaire (Appendix 2) between 1 (= not good at all) to 7 (= very good). And then, we summed up the score of questions from same dimension and divided by five. The result is the final score of this dimension. Finally, we used these data to draw the model (figure 7), the result is showing below:
Finally, FLB got general score 3.333 in Services, 3.166 in Flow, 2.833 in Information, 1.5 in Resource commitment and 2.166 in Information. We will explain the result in the discussion part later.

### 3.32 AHP and the attributes

According to the results from the audit model, the empirical findings and the interview with FLB’s logistics manager, we assumed the seven attributes’ pair-wise comparison matrix for FLB. We calculated the relative weights of the criteria of FLB by using the AHP method, in order to see which attribute is mostly concerned by them. Also FLB could test their customers’ (or potential customers) relative weights of the criteria to see whether or not FLB can satisfy them. Or FLB wants to expand its reverse logistics business to meet the needs of their potential customers by knowing the relative weights of the criteria of themselves as well as the customers.

Here, in order to reduce the computation, we only decomposed the problem into seven main attributes and leave out those 34 sub-attributes which we showed above. Meanwhile, we picked three of them (3PLS, OPC and RLFs) to give an example to show how to utilize the AHP method to make the pair-wise comparisons and to calculate the weigh.

As we can see from figure 8, the weight of 3PLS from the FLB’s point of view is equal to 0.637, the OPC is 0.302 and the RLFs are 0.061. Those numbers subjectively indicate that OPC is more important than the other two from the view of FLB. Likewise, from the customers’ points of view, the customer 1 thinks the RLFs is the most important one among those three attributes, and they don’t care that much about the 3PLS. However, the customer 2 pays more attention to the 3PLS.
Due to our understanding to the FLB, we helped FLB to set their preference attention between 3PLS, OPC and RLF. And we made the Pair-wise comparison for each of them, and then we got the results in table 6.

<table>
<thead>
<tr>
<th></th>
<th>OPC</th>
<th>RLF</th>
<th>3PLS</th>
</tr>
</thead>
<tbody>
<tr>
<td>OPC</td>
<td>1.000</td>
<td>7</td>
<td>0.333</td>
</tr>
<tr>
<td>RLF</td>
<td>0.143</td>
<td>1.000</td>
<td>0.125</td>
</tr>
<tr>
<td>3PLS</td>
<td>3</td>
<td>8</td>
<td>1.000</td>
</tr>
<tr>
<td>Sum</td>
<td>4.143</td>
<td>16</td>
<td>1.458</td>
</tr>
</tbody>
</table>

**Table 6** Pair-wise comparison matrix of FLB

Next, according to the calculation of PV for each attribute, we got the figures shows in the table 7.
Table 7 The weights of the criteria of FLB

<table>
<thead>
<tr>
<th></th>
<th>OPC</th>
<th>RLF</th>
<th>3PLS</th>
<th>PV(Priority Vector)</th>
</tr>
</thead>
<tbody>
<tr>
<td>OPC</td>
<td>0.241</td>
<td>0.438</td>
<td>0.228</td>
<td>0.302</td>
</tr>
<tr>
<td>RLF</td>
<td>0.035</td>
<td>0.063</td>
<td>0.086</td>
<td>0.061</td>
</tr>
<tr>
<td>3PLS</td>
<td>0.724</td>
<td>0.500</td>
<td>0.686</td>
<td>0.637</td>
</tr>
</tbody>
</table>

About each attribute considered by the customers, we use the same way to calculate the PV for every customer. See table 8, 9 and 10.

Table 8 Pair-wise comparison matrix for OPC

<table>
<thead>
<tr>
<th></th>
<th>customer 1</th>
<th>customer 2</th>
<th>PV</th>
</tr>
</thead>
<tbody>
<tr>
<td>customer 1</td>
<td>1</td>
<td>3</td>
<td>0.750</td>
</tr>
<tr>
<td>customer 2</td>
<td>0.333</td>
<td>1</td>
<td>0.250</td>
</tr>
</tbody>
</table>

Table 9 Pair-wise comparison matrix for RLF

<table>
<thead>
<tr>
<th></th>
<th>customer 1</th>
<th>customer 2</th>
<th>PV</th>
</tr>
</thead>
<tbody>
<tr>
<td>customer 1</td>
<td>1</td>
<td>7</td>
<td>0.875</td>
</tr>
<tr>
<td>customer 2</td>
<td>0.143</td>
<td>1</td>
<td>0.125</td>
</tr>
</tbody>
</table>

Table 10 Pair-wise comparison matrix for 3PLS

<table>
<thead>
<tr>
<th></th>
<th>customer 1</th>
<th>customer 2</th>
<th>PV</th>
</tr>
</thead>
<tbody>
<tr>
<td>customer 1</td>
<td>1</td>
<td>0.166</td>
<td>0.143</td>
</tr>
<tr>
<td>customer 2</td>
<td>6</td>
<td>1</td>
<td>0.857</td>
</tr>
</tbody>
</table>

Finally, we got the overall priority for each customer. The overall priority of customer 1 is 0.370
In like manner, the overall priority of customer 2 is 0.623

Now, in the selecting phase, we just need to select the most appropriate one. As the
results calculated above, it posed out the overall priorities of each customer, therefore, we can say that the customer 2 is the more suitable one for FLB to provide their RL services regards to the three attributes of 3PLS, RLF and OPC. In our case, the CR=0.0913<0.1, it illustrates our evaluation is acceptable according to Saaty’s theory.

4. Discussion

4.1 The RL audit model

According to the result of calculation, we found out FLB got a high score in Services, Flow and Information but lower in Innovation and Resource commitment. In surprise, the score in Resource commitment is extremely low, only 1.5 what means that they do badly in this dimension. From the whole view of the picture, we can see none dimension got a score over 3.5--the balance score, which manifests FLB’s capability in RL is very limited. In this part, we will integrate this result with the FLB manager’s interview first, and then try to explore what caused the general low score in RL competence audit model. In the same time, we will give our suggestions about how to improve their RL capability in the future also.

Services

FLB now are providing services to 12 different customers, but only 5 of them cooperated with FLB in RL. From the interview we knew that one of the RL customers had left and organized the RL by themselves last year. Why are they losing customers in RL? In our opinion, the reasons are: FLB does not ask their customers what kinds of services they want, and doesn’t know whether they satisfy their customers or not and is unwilling to introduce customize service in RL. So far, they just have some limited services in RL, such as inbound handling of returned units, functional test and first visual, which are some bonded services within their forward flow and are not really for the RL. For the disposal service, FLB just can provide the basic services: like sending the return products to the recycling companies, collecting the carton boxes and different plastic materials.

According to the situations we mentioned above, we suggest that FLB should think more about how to provide more services and activities in RL in the future. They can try to extend and improve their repair service, make it as the core competitive advantage in the RL market. Services like the Resell, Sell via Outlet, Refurbish, Reclaim Materials, Landfill and Reuse might be considered by the managers to develop in FLB. As we know that FLB is a medium side 3PLs, it seems difficult for them to provide comprehensive RL services. Therefore, we think they should concentrate on the customization services from now, trying to provide the customize service.
Flow
When we were talk about the flow management of RL, it is very important to know how much the priority you own in the RL flow or do you have the authority to make change of it. However in FLB, we realized that most of their customers are organizing their own RL flow, and what they do are just outsourcing one or two parts of RL flow to FLB. The lack of authority causes the lack of competence in how to manage the whole RL flow. So first of all, we propose that they should centralize their resources in RL now, and try to provide the whole RL flow management service to some of their customer. Furthermore, we think making effort in some basic parts of the whole RL’s flow management we showed below will help FLB get a great advance. For instance, set up an effective “Gatekeeper” to avoid the wrong returned products goes inside the backward flow and record the clear information of which you receive, standardized their RL process and minimize the time spend in RL process. Now FLB are not doing very well in time control, waiting the customers’ instruction will great influence the total time of RL process. Regard to this, we think the FLB might try to measure the time they spend on RL process, and to minimize it as possible as they can in the future. Since the less time the returned products stay in warehouse, the lower cost they will spend and the rest space and resource could help them to earn more money.

Information
Now except the information system which is shared with Ericsson, FLB also has the WMS (warehouse management system) and Customer Login System with them. Nevertheless, both of them are mostly utilizing in FLB’s forward flow management. So if FLB wants to improve its competence in RL, they should set up an exclusive system in RL management to facilitate the management in RL. In addition, more assistive technologies should be included in this IS in order to help to reduce the time and difficulty of collecting the information. These technologies we suggest might be introduced in the IS are: POS (Point of sale) registration, RFID (Radio Frequency Identification) and Two-Dimensional Bar Coding, and so on.

Information here not only represents the data of returned products or transaction, but also indicates what customers are thinking and their needs. FLB should communicate with them frequently and try to exploit the useful information from their customers. So the issues how to accelerate the improving process of information collection and disposing capability as well as how to merge the RL into their successful forward flow functions should be given priority by FLB.

Resource commitment
From the results of the model, it obviously indicates that the Resource commitment is the weakest dimension in FLB, and refers to they are not focusing on RL and underestimate the importance of it. To their employees, manager just simply notifies them that FLB has the RL, where it locates and what it is. The other tasks for example training, inspiriting and rewarding are few or never done by the head manager. At the
same time, in the manager’s mind, RL was never seen as one of the potential competitive advantages in the future before we interviewed with them. By the way, FLB did not give any financial support to the development of RL, and they have no confidence in satisfying their customers in RL’s handling. Due to the little investment in RL, the management resource is very scarce in FLB. There are not any special managers and employees working on RL now.

In our opinion, if we treat the RL as a construction, the resource commitment could be saw as the foundation of it. Without the support from the foundation, nothing will be constructed above the air. So we consider, if the FLB really wants to develop their RL capability, the most emergent thing they need to do is to increase the status of RL in their mind.

Innovation
SMEs (small and middle size enterprises) were thought more innovative by Tidd, J. and Bessant, J. (2005). However, to be one of the SMEs 3PLs in Sweden, FLB is not innovative in RL. Through our research, we believe that the main reason why they are not creative in RL is that they don’t think the RL is a major competitive edge in the third party logistics market, and just classified it into the value added services. The parts of innovation are difficult to integrate to the whole flow owned the by customer, so they are hard to be accepted. Although lots of outside factors will hinder FLB innovation, we think they still can concentrate into three directions to try creativity. One is focus on their experience to create some new ways to solve problem. The second is to try to follow the innovation process to make innovation happen: Idea generation, Selection, and implement (Tidd, J. and Bessant, J. 2005). The last one is to cooperate with university or some agencies to introduce new technology into FLB to achieve the innovation.

Environment
Right now FLB is doing quite well in environmental issues within their company, and they might create a marketing edge by using greening as FLB’s unique characteristic for attracting the environmentally conscious customers. They also have some environmental training lessons for their employees. Taking the fuel for example, lowering trucking miles, not only lowers emissions but also saves on fuel consumption and drivers’ working hours (Remko I. van Hoek I, 1999).

But from the view of their customers, how well does FLB’s RL service help their customers to improve their environmental performance? We would like to say unsatisfied. Due to the RL services and activities which FLB could provide are limited. Therefore, we think there still is a huge room for development to enhance their environment-friendly activities and services. If FLB want to help their customers to reuse the returned products, to reduce the need purchase new parts, to reduce material disposition of the landfill, and to recycle product in the remanufacturing and disassembling areas where appropriate, in order to improve the environmental
performance of their customers, FLB needs to invest more time and budget on the research of RL activities.

### 4.2 AHP method

So what can FLB learn from the results from the AHP calculation? Let’s assume the customer 1 was the Ericsson and the customer 2 was the Gevalia (was a customer of FLB). As we know Ericsson is the main customer of FLB, and of course FLB wants to keep them to stay, but it seems like FLB does not suit for providing RL services for them compare with the Gevalia. But according to the performance of FLB and the requirements of Ericsson in different aspects of RL which we assumed above, FLB could change their emphasis on the things which Ericsson is interest in, the RLFs for instance. We can see that Ericsson has a preference on the aspect of reverse logistics functions. Knowing this information, FLB might put more efforts on RLFs to satisfy the needs of Ericsson, such like researching and implementing new RL service within FLB to expand their RL business. In this way, FLB could find exactly what the customers’ needs in RL in the market, and could make sure their capability of RL is directed against their target customers. FLB does not want to change their RL service quality just because the requirement of a specific customer, they just want to know whether or not the market is feasible for them, they can also use this method to evaluate the “big fish” in the market to see how much they can satisfy those “fishes”.

However, the model we provided above, gives the guidance for such a 3PRLP to evaluate their performance and the requirements of their targeted or potential customers in the market. In order to place or change their emphasis on different aspects of their RL services to attract the customer which they want to keep or exploit.

On the other hand, as we can see from the findings of FLB by using the AHP method, the figure of the CR almost equals to 0.1, this means that although the results is acceptable but still the consistency of the judgments made above in the matrix is not so good, this result probably is due to our subjective judgments for FLB and their customer we talked in the limitation part.

### 4.3 The new approach

Actually, the AHP method is based on the RL audit model, since the weight of FLB’s RL performance is in accordance with the results from the RL audit model. The RL audit model is a model which a 3PRLP can evaluate their RL capability from the view of themselves. On the contrary, the AHP method is a way to analyze the 3PRLP’s RL competence from the customer’s point of view. Combining and integrating the two models together, we constructed a new approach (figure 9)
After understanding what those two models can bring the knowledge about RL to FLB, next we shall integrate them together to see what else FLB could get from this series analysis. Take the customer 1 above as an example, we assumed that the customer 1 was Ericsson, and the results of AHP method indicated that FLB seems not suit to provide RL service to them, since Ericsson has a great preference on the RLFs. However, through the RL audit model we found that FLB just have some limited services in RL, such as inbound handling of returned units, functional test and first visual which are not exactly a function of their RL. For the disposal function, FLB just can provide the basic services: like sending the return products to the recycling companies, collecting the carton boxes and different plastic materials. As a result, FLB could focus on their service dimension if they want to capture the notice from Ericsson, and according to our suggestion above, that would be a reasonable guideline for them to develop their RL capability in the aspect of service. Likewise, some other aspects could be addressed and developed by FLB if they have a target customer.

5. Conclusion

This paper has launched a new approach to help Third party logistics service provider (3PLs) to develop and improve their Reverse logistics. There have two main models have been adopted to assist us to do the investigation in the new approach in our paper.

The AHP method was using to analyze how a 3PLs could satisfy their customers in RL. Following the calculative steps in AHP method, we could base on one 3PLs RL competence in currently to find out which customer is the most appropriate one to provide RL service for. Besides, it also manifests the gap between the 3PLs and their target customer, helping the 3PLs to realize their weakness in RL competence and
showing how to improve them to gain or satisfy the target customer. The second model we used was the RL audit model. This model was modified from Tidd’s Continues innovation audit model. Using the questionnaire to collect the fundamental information in one 3PLs, and basing on this information we could draw a visual picture to show their RL competence. With help of the result, one 3PL can easily get a holistic view of their RL competence at present, and realize how to improve the weak dimensions to increase the whole RL competence. Although the two models are different in basic theories, we find that they are always connected to each other. The RL audit model provide the underlying judgment to the calculation in AHP, and on the contrary, AHP show particular sub attributes to help 3PLs use RL audit model to improve their competence. The new approach which combined by them will be effective in helping the 3PLs in developing their RL competence. Meanwhile, our research precisely answered our research question as we posed at the very beginning. Through our research those 3PLs can get a general view about the market of the RL as well as the knowledge regards to how to become a successful 3PRLP.

In order to test our model, a case study was adopted in our paper. FLB, as a middle size 3PL has been used to test and verify our new approach. Through the utilization in practice, we believe that our approach have a great contribution in helping the 3PLs to develop and in improving their Reverse logistics to a certain extent. However, we regret to say that there still have some limitations in our research, e.g. lacking of information of case company’s customer greatly hinders us to use the AHP method, and it is easily to put subjective judgments in measuring the result from RL audit model.

6. Further research

Due to the limitation of our thesis we talked above, there is a big room for us to do our further research, making the calculation more accurate and doing the research in how well and doable our approach will help 3PLs improve their RL competence after they evaluate their company by using our approach, for instance.
7. Reference


Saaty, T.L. (1990) An Exposition on the AHP in Reply to the Paper “Remarks on the


## 8. Appendix 1

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Selection criteria</th>
<th>Relevance in logistics outsourcing</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Quality (OPC1)</td>
<td>Able management of the provider may not only provide good service to the user but may also foster a long-term relationship between the user and the provider.</td>
<td>Andersson and Normann (2002), Lynch (2000), Boyson et al. (1999)</td>
</tr>
<tr>
<td>2</td>
<td>Cost (OPC2)</td>
<td>It refers to the total cost of logistics outsourcing, which should be minimized</td>
<td>Lynch (2000), Langley et al. (2002), Boyson et al. (1999), Stock et al. (1998)</td>
</tr>
<tr>
<td>3</td>
<td>Time (OPC3)</td>
<td>Significant OPC consist of traditional strategic organizational metrics such as time</td>
<td>Kleindorfer and partovi (1990)</td>
</tr>
<tr>
<td>4</td>
<td>Flexibility (OPC4)</td>
<td>Flexibility in operations and delivery may enable the user to give customized service to its customers, particularly in special or no routine requests</td>
<td>Stank and Daugherty (1997)</td>
</tr>
<tr>
<td>5</td>
<td>Collection (RLF1)</td>
<td>To serve the purpose of meeting product take-back for either warranty or regulatory reasons</td>
<td>Schwartz (2000)</td>
</tr>
<tr>
<td>6</td>
<td>Packing (RLF2)</td>
<td>Depending on the packaging method at the origin, additional services are performed by a 3PL at the destination and then components are taken to the factory. The goal is to minimize total cost by selecting the correct packaging type</td>
<td>Dowlatshahi (2000), Jeffery and Ramanujam (2006)</td>
</tr>
<tr>
<td>7</td>
<td>Storage (RLF3)</td>
<td>Storage means to make a plan for the maximum and best use of the available storage space</td>
<td>Kallampakos et al. (2002)</td>
</tr>
<tr>
<td>8</td>
<td>Sorting (RLF4)</td>
<td>Decision of what to do with each product</td>
<td>Schwartz (2000)</td>
</tr>
<tr>
<td>9</td>
<td>Transitional process (RLF5)</td>
<td>The time for transition of each and every process in logistics plays a key role</td>
<td>Jules and Van Dijk (1990)</td>
</tr>
<tr>
<td>10</td>
<td>Delivery (RLF6)</td>
<td>Two dimensions of DP, namely &quot;speed&quot; and &quot;reliability&quot;, are important for the satisfaction of the user</td>
<td>Stock (1990)</td>
</tr>
<tr>
<td>11</td>
<td>Reclaim (OR1)</td>
<td>Where the sole purpose is to reclaim the product</td>
<td>Meade and Sarkis (2002)</td>
</tr>
<tr>
<td>12</td>
<td>Recycle (OR2)</td>
<td>It refers to the change in the physical and/or chemical make up of the product</td>
<td>Dowlatshahi (2000)</td>
</tr>
<tr>
<td>13</td>
<td>Remanufacture (OR3)</td>
<td>Ability to remanufacture a product around a reusable core</td>
<td>Dowlatshahi (2000)</td>
</tr>
<tr>
<td>14</td>
<td>Reuse (OR4)</td>
<td>It refers to the reuse of the product with little additional production requirement</td>
<td>Demir and Orhan (2003)</td>
</tr>
<tr>
<td>15</td>
<td>Disposal (OR5)</td>
<td>The process of sending the products to their desired destination</td>
<td>Schwartz (2000)</td>
</tr>
<tr>
<td>16</td>
<td>Warehouse management (3PL52)</td>
<td>Warehousing concerns those material handling activities that take place within the warehouse, receiving and shipping areas. Basically, there are three types of warehouses management activities, distribution warehouses, production warehouses, contract warehouses</td>
<td>Dowlatshahi (2000), Van and Zijm (1999)</td>
</tr>
<tr>
<td>Sl. No.</td>
<td>Selection criteria</td>
<td>Relevance in logistics outsourcing</td>
<td>References</td>
</tr>
<tr>
<td>-------</td>
<td>-------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>17</td>
<td>Transportation management (GPLS5)</td>
<td>Transport management in logistics should cover not only parameters on operations efficiency, but also measures of service effectiveness. Transportation accounts for a major part of the gross national product of most countries.</td>
<td>Kleinsorge et al. (1991)</td>
</tr>
<tr>
<td>18</td>
<td>Inventory management (GPLS1)</td>
<td>Inventory is commonly used to measure performance in supply chain management literature. It deals with the problem of determining the users optimal ordering quantity and reorder policies that will maximize the profit per unit time under the condition of permissible delay in payments.</td>
<td>Gunasekaran et al. (2001), Davis and Gaither (1985)</td>
</tr>
<tr>
<td>19</td>
<td>Shipment consolidation (GPLS3)</td>
<td>The companies use just in time thinking of purchasing which leads to frequent shipment of small quantities.</td>
<td>Gupta and Bagchi (1987)</td>
</tr>
<tr>
<td>20</td>
<td>Carrier selection (GPLS4)</td>
<td>A carrier selection uses one or more modes of transportation.</td>
<td>Khoo and Mitsuru (2006), Holguin (2002)</td>
</tr>
<tr>
<td>21</td>
<td>Order management (IT2)</td>
<td>The sensitive variation in the usage of general ordering policy at a specific time.</td>
<td>Jing et al. (2006)</td>
</tr>
<tr>
<td>22</td>
<td>Supply chain planning (IT3)</td>
<td>Enterprise resource planning (ERP) is a system planning all aspects of a business including production planning, purchasing, manufacturing, sales, distribution, accounting, and customer service.</td>
<td>Scalle and Cotteleer (1999)</td>
</tr>
<tr>
<td>23</td>
<td>Shipment and tracking (IT4)</td>
<td>A shipment uses one or more modes of transportation, including parcel delivery, postal service, courier, private truck, for-hire truck, rail, water, pipeline, air, and other modes. Internet online tracking tools will provide more shipment details in less time.</td>
<td>Khoo and Mitsuru (2006), Holguin-veras (2002)</td>
</tr>
<tr>
<td>24</td>
<td>Freight payment (IT5)</td>
<td>Freight payments are incurred on a per container basis. If the container is not fully utilized, it costs the same, so the cost per box goes up.</td>
<td>Jeffery and Ramanujam (2006)</td>
</tr>
<tr>
<td>25</td>
<td>Profitability (IUSPL3)</td>
<td>The annual profits of the service provider have to show an upward trend. Providers increasingly must innovate to profitably serve as big a footprint as possible across the large commodity segment and the growing.</td>
<td>Hendrik et al. (2006)</td>
</tr>
<tr>
<td>26</td>
<td>Customer satisfaction (IUSPL1)</td>
<td>The reputation of a provider refers to the opinion of the people about how good they are in satisfying the needs of the customer. The reputation of a provider plays a major role in its selection. This is more relevant in the initial screening of the providers.</td>
<td>Lynch (2000), Boyson et al. (1999)</td>
</tr>
<tr>
<td>Sl. No.</td>
<td>Selection criteria</td>
<td>Relevance in logistics outsourcing</td>
<td>References</td>
</tr>
<tr>
<td>--------</td>
<td>--------------------</td>
<td>-----------------------------------</td>
<td>------------</td>
</tr>
<tr>
<td>27</td>
<td>Effective communication (US1)</td>
<td>Marketing studies find that the level of communication determines the nature of the interorganizational relationship. Bensaou found that the level of communication in buyer–supplier relations was positively related to the scope of electronic data interchange use</td>
<td>Mohr and Spekman (1994), Bensaou (1993)</td>
</tr>
<tr>
<td>28</td>
<td>Service improvement (US2)</td>
<td>To motivate service providers, an organization can also offer incentives. They include the sharing of achieved cost savings, giving consideration for increased volumes, future business and recognizing supplier improvements through awards</td>
<td>Monczka et al. (1993), Gunipero (1990)</td>
</tr>
<tr>
<td>29</td>
<td>Overall working relations (US4)</td>
<td>It is important to have a good working relation with employees at the provider’s end; otherwise it may lead to strike, lockouts, sabotage, and other such unwanted activities, which may adversely affect the logistics operations</td>
<td>Lynch (2000), Boyson et al. (1999), Langley et al. (2002)</td>
</tr>
<tr>
<td>30</td>
<td>Employee morale (IU3PL4)</td>
<td>The willingness of the provider to retain some of the user’s logistics employees, who would otherwise become unemployed after the outsourcing contract, wards off any chance of sabotage. It also improves the goodwill between the user and the provider</td>
<td>Razzaque and Sheng (1998)</td>
</tr>
<tr>
<td>31</td>
<td>Frequently updating (IU3PL2)</td>
<td>Introductions of changes and modifications in process technologies, organizational and operational practices occur most frequently in high-technology plants. In fact, rapid and repeated innovation implementation is absolutely central to any high-technology manufacturing operations</td>
<td>Mohrman and Glinow (1990)</td>
</tr>
<tr>
<td>32</td>
<td>Customer satisfaction (OPC5)</td>
<td>In order to survive in this competitive market, companies should continue to improve their service performance effectively. According to a recent study network performance is considered as important for increasing customer-service performance</td>
<td>Kim et al. (2004), Kwang et al. (2007)</td>
</tr>
<tr>
<td>33</td>
<td>Warehouse management (TI1)</td>
<td>Warehousing concerns those material handling activities that take place within the warehouse, receiving and shipping areas</td>
<td>Dowlatshahi (2000), Van and Zijm (1999)</td>
</tr>
<tr>
<td>34</td>
<td>Cost savings (US3)</td>
<td>A sound financial performance of the provider ensures continuity of service and regular upgrading of the equipments and services, which are used in logistics operations</td>
<td>Andersson and Norrman (2002), Boyson et al. (1999)</td>
</tr>
</tbody>
</table>
9. Appendix 2

Interview questions

The RL audit Model:
We modified the audit model (Tidd, J. and Bessant, J. 2005), which used to measure a company’s innovation capability in our innovation management course, to a new model that can clearly show a company’s Reverse logistics competence. We changed the Tidd’s innovation’s old five dimensions: Strategy, Learning, Linkages, Processes and Innovation to new five ones, they are Services, Flow, Information, Resources commitment and Innovation. The RL audit model is showing below:

![RL audit Model](image)

The RL audit Model: The model for auditing RL competence of 3PLs

After we got the reverse logistics data from one company, we can use the RL audit model to draw a picture, and give a direct and clear show in its reverse logistics capability.

In order to collect the information to draw the picture for the two models and get a deeper understanding in FLB’s reverse logistics, we designed several interview questions as below, what will focus on five dimensions, environment and our interested questions:
**Services**
1. Are your packaged designed for easy to return and recycle? Can you give us some examples?

2. Can you fulfill the demand of your different customers? How you satisfy your customer?

3. How many services you can provide to your customer in RL so far?

4. How you usually dispose your customers’ returned product? The percentage of them?

5. Do you have any unique technology to deal with your customers’ returned products? What are they?

6. Do you also outsource to some companies to help you dispose your customers’ returned product?

**Flow**
1. Do you have the ‘Gatekeeper’ in the flow of your Reverse Logistics? How does it work?

2. Do you have Centralized Return Centers (CRC)? How do you distribute the old products?

3. What is your Reverse Logistics flow, for different customers? Can you describe some examples to us?

4. How to manage the flow? Is there having some problem when you manage it?

5. How long the RL process will be taken? For example the reuse process, the recycle process and the landfill process? Is there having an average time?

6. Have you standardize your RL processes? Like set up rules and schedule for it?

**Information**
1. Do you have an information system to help you to manage RL? How does it work?

2. Do you use your information system to track your returned products? How can you do it? Have you used the technology like POS (Point of sale) registration, RFID (Radio Frequency Identification) and Two-Dimensional Bar Coding?

3. Have you built an information system network in order to share your Reverse Logistics’ information with you corporate partners, suppliers or customers?
4. Do you frequently collect information from your customer?

5. Do you share the information in your forward and backward flow?

6. Do you always thinking how to improve your way in getting and disposing information?

**Resource Commitment**

Person

1. How do you support your employees in the RL’s working? For example, empower them to do research in this area and training them.

2. Whether the managers in FLB think RL is one of the potential competitive advantages in the future? How many persons working on it?

Finance

3. Do you invest in RL? Compare to the others services investment, how many percent it will occupy?

4. Whether your investment in RL is rising every year? Whether you will increase the investment in RL in the future?

Management

5. Do you allocate your management resource on RL management? How?

6. Do you frequently measure your organization in RL and always thinking how to improve it?

**Innovation**

1. Are there some creative activities in your RL? What are they and how do they work?

2. Do you connect with a university or some agencies to improve your RL technology?

3. Do you have training programs to train your employees in RL?

4. Have you develop some new technology in your RL based on your experience? What are they?

5. Do you always thinking to construct a creative environment or culture in your company to incent your employees’ innovation in RL?

6. How do you collect, select and implement the new ideas in RL?
**Environment**
1. Do you take responsibility to take back all the packaging of your customers’ product? For example: the container, pallet and plastic packaging (use to buffer)?

2. Are there having different RL solution and strategy in different countries (if you have some international business)? Like Europe and Asia?

3. To what extend you think your RL makes contribute to help you and your customers reducing environment impact?

4. Do you help your customers to test or measure the harm of their waste products to human being and environment?

5. Do you instruct and train your employees to set up the environmental view?

6. Do you help your customer to set up the environmental view if they not doing well?

**Others**
1. Compared with other three-party logistics companies, do you think the RL is a competitive advantage to you?

2. How do you integrate your forward and reverse logistics? Are they used in the same chain, like the DC also used as CRC?

3. Do you always try to know the customers’ thinking? How they think about your Reverse Logistics?

4. Do your customers and suppliers also require your do best in protect environment like them (Ericsson)? How do you do it?

5. Do your customers and supplier will test your work in RL? How?