Int. J. Production Economics 140 (2012) 204–211

Contents lists available at SciVerse ScienceDirect

Int. J. Production Economics

journal homepage: www.elsevier.com/locate/ijpe

Analysis of third party reverse logistics provider using interpretive structural modeling

Kannan Govindan [a,*], Murugesan Palaniappan [b], Qinghua Zhu [c], Devika Kannan [d]

[a] Department of Business and Economics, University of Southern Denmark, 5230 Odense M, Denmark
[b] PVP College of Engineering and Technology For Women, Dindugal 624708, India
[c] School of Business Management, Dalian University of Technology, Dalian, China
[d] Indian Institution of Industrial Engineering, Navi Mumbai, India

ARTICLE INFO

Article history:
Received 26 October 2010
Accepted 30 January 2012
Available online 13 February 2012

Keywords:
Supply chain management
Reverse logistics
Attributes
3PRLP
ISM

ABSTRACT

Due to growing economic environment and the introduction of new technologies in marketing, another topic of great interest to logistics today is the use of contract or third party services. In the complicated business world, the company is involved in reuse, recycling, and remanufacturing functions using a third party logistics provider which has an impact on the total performance of the firm. In the development of the reverse logistics concept and practice, the selection of providers for the specific function of reverse logistics support becomes more important. After scanning the surplus of literatures, it was concluded that multiple dimensions and attributes must be used in the evaluation and selection of 3PRLP.

The attributes play an important role in selecting a third party reverse logistics provider (3PRLP). Interpretive structural modeling (ISM) methodology is adopted in this model, which can be used for identifying and summarizing relationships among specific attributes for selecting the best third party reverse logistics provider among the '*n*' 3PRLPs.

1. Introduction

The term supply chain represents the complete set of activities involved in marketing, planning, purchasing, full manufacturing, distribution, delivery process, and reverse logistics. Nowadays, the supply chain plays a vital role in the value creation process. Supply chain management recognizes the importance of, and focuses effort on, achieving tight integration between the various links of the chain. To be efficient, a supply chain must exploit modern productivity techniques and approaches, for example JIT purchasing, economic batch sizes, strategic inventory, reverse logistics, third party logistics, etc.

Logistic management is termed as the detailed process of planning, implementing, and controlling the efficient, cost effective flow and storage of materials and products, and related information within a supply chain to satisfy demand (CLM, 2004), and logistics is recognized as the key enabler that allows a company to increase and maintain its competitive advantage and ensures maximum customer satisfaction (Drucker, 1962).

Reverse logistics is the process of moving goods from their typical final destination to another point, for the purpose of capturing value otherwise unavailable, or for the proper disposal of the products (Rogers and Tibben-Lembke, 2001; Dowlatshahi, 2000). Reverse logistics is practiced in many industries, and its effective use can help a company to compete in all streams of advantages. Many situations exist for the product to be placed in a reverse flow, such as commercial returns, warranty returns, end-of-use returns, reusable container returns, and others (Du and Evans, 2008).

According to Andel (1997), effective reverse logistics is believed to result in several direct benefits, including improved customer satisfaction, decreased resource investment levels, and reductions in storage and distribution costs (Autry et al., 2000). Many manufacturers and retailers recognize the importance and consider the outsourcing of reverse logistics (Du and Evans, 2008).

3PRLP selection and evaluation is one of the most critical activities that commits significant resources and impacts the total performance of the firm. The attributes involved in the selection and evaluation process may vary depending on the type of product considered, and these attributes are often in conflict with one another. To enhance 3PRLP selection, the proposed 3PRLP attributes are grouped into seven main attributes such as third party logistics services (3PLS), reverse logistics functions (RLF), organizational role (OR), user satisfaction (US), impact of use of 3PL (IU3PL), organizational performance criteria (OPC), IT Applications (IT), and 35 sub-attributes as shown in Table 1.

* Corresponding author.
E-mail address: gov@sam.sdu.dk (K. Govindan).

0925-5273/$ - see front matter © 2012 Elsevier B.V. All rights reserved.
doi:10.1016/j.ijpe.2012.01.043

Table 1
Attributes & sub-attributes (adopted from Kannan (2009)).

Attributes	Sub-attributes	Reference
Third Party Logistics Services (3PLS)	Inventory Replenishment (3PLS1), Warehouse Management (3PLS2), Shipment Consolidation (3PLS3), Carrier Selection (3PLS4), and Direct Transportation Services (3PLS5)	Dowlatshahi (2000), Van and Zijm (1999), Kleinsorge et al. (1991), Gunasekaran et al. (2001), Davis and Gaither (1985), Gupta and Bagchi (1987), Khoo and Mitsuru (2006), and Holguin-Veras (2002)
Reverse Logistics Functions (RLF)	Collection (RLF1), Packing (RLF2), Storage (RLF3), Sorting (RLF4), Transitional Processing (RLF5), and Delivery (RLF6)	Schwartz (2000), Dowlatshahi (2000), Jeffery and Ramanujam (2006), Kaliampakos et al. (2002), Van Dijck (1990), and Stock (1990)
Organizational Role (OR)	Reclaim (OR1), Recycle (OR2), Remanufacture (OR3), Reuse (OR4), and Disposal (OR5)	Meade and Sarkis (2002), Dowlatshahi (2000), Demir and Orhan (2003), and Schwartz (2000)
User Satisfaction (US)	Effective Communication (US1), Service Improvement (US2), Cost Saving (US3), and Overall Working Relations (US4)	Mohr and Spekman (1994), Bensaou (1993), Monczka et al. (1993), Gunipero (1990), Lynch (2000), Boyson et al. (1999), Langley et al. (2002), and Andersson and Norrman (2002)
Impact of use of 3PL (IU3PL)	Customer Satisfaction (IU3PL1), Frequent Updating (IU3PL2), Profitability (IU3PL3), and Employee Morale (IU3PL4)	Razzaque and Sheng (1998), Hendrik et al. (2006), Lynch (2000), Boyson et al. (1999), and Mohrman and Von Glinow (1990)
Organizational Performance Criteria (OPC)	Quality (OPC1), Cost (OPC2), Time (OPC3), Flexibility (OPC4), Customer Satisfaction (OPC5), and Service (OPC6)	Kim et al. (2004), Kwang et al. (2007), Andersson and Norrman (2002), Lynch (2000), Boyson et al. (1999), Langley et al. (2002), Stock et al. (1998), Kleindorfer and Partovi (1990), and Stank and Daugherty (1997)
IT Applications (IT)	Warehouse Management (IT1), Order Management (IT2), Supply chain planning (IT3), Shipment and Tracking (IT4), and Freight Payment (IT5)	Dowlatshahi (2000), Van and Zijm (1999), Jing et al. (2006), Scalle and Cotteleer (1999), Khoo and Mitsuru (2006), Holguin-Veras (2002), and Jeffery and Ramanujam (2006)

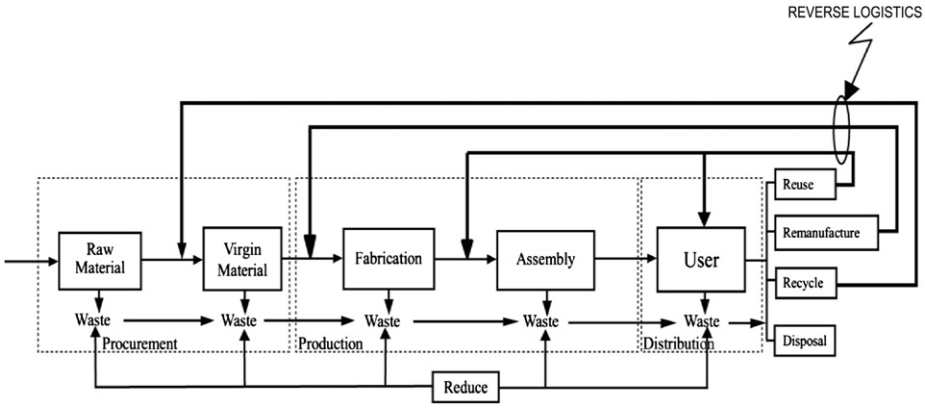

Fig. 1. Operational life cycle of a product and reverse logistics location (adopted from Meade and Sarkis (2002)).

The proposed attributes which aid in evaluating 3PRLP are interesting and become the objective of the building of a new model using ISM. It can be used for identifying and summarizing relationships among a specific variable that defines a problem or an issue and provides us with a means by which order can be imposed on the complexity of variables (Sage, 1977). The insight from the model would help supply chain managers in strategic planning to select the best 3PRLPs.

After the introduction, the remainder of this paper is organized as follows. The literature review is given in Section 2. Section 3 describes the problem, and Section 4 presents a solution methodology. The application model (case study) is discussed in Section 5. The result analysis and conclusion of the paper is presented in the final section.

2. Literature review

Many business groups have recently defined logistics for the private sector. All of these definitions of logistics focus on the organization of services and supplies and the movement of goods from one point to another. Aghazadeh (2003) states that "logistics is the process of strategically managing movement and storage of material or products and related information from any point in the manufacturing process through consumer fulfillment."

Over the last decade, companies only considered the forward supply chain for maximizing their benefit, but did not realize the responsibility for their products after the product life span, which is called reverse logistics. In logistics, reverse logistics is not a new industrial practice, but it has recently received growing attention as more companies are using it as a strategic tool to increase profit, to avoid any wastage, and even to benefit the customer relationship.

Rogers and Tibben-Lembke (1999) define reverse logistics as "the process of planning, implementing, and controlling the efficient, cost effective flow of raw materials and related information from the point of consumption to the point of origin for the purpose of recapturing value or proper disposal." It is concerned with issues such as reclaiming, recycling, remanufacturing, reuse, take back, and disposal needs to be available for adequate service requirements.

A complete supply chain system includes both forward logistics and reverse logistics as shown in Fig. 1. Traditionally, management is concentrated on improving forward logistics operations to enhance a firm's competitiveness. Recently, forward logistics operations also