International Conference on Modeling, Optimization and Computing

A decision making methodology for the selection of reverse logistics operating channels

S.Senthil[a*], B.Srirangacharyulu[b], A.Ramesh[c]

[a]Department of Mechanical Engineering, Kamaraj College of Engineering and Technology, Virudhunagar 626001, India
[b]Department of Management Studies, Indian Institute of Management, Tiruchirappalli 620015, India
[c]Department of Mechanical Engineering, National Institute of Technology Calicut 673601, India

Abstract

An efficient management of product returns is a strategic issue. Nowadays, customer expect manufacturer to develop a reverse logistics system so that the returned products can be recovered. With the development and advancement of reverse logistics practice, the selection of reverse logistics operating channels becomes more important. There are three operating channels of reverse logistics; Manufacturer Operation, Third Party Operation, Joint Operation. In this paper a hybrid methodology based on Analytical Hierarchy Process (AHP) and Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) under fuzzy environment is proposed for the selection and evaluation of reverse logistics operating channels. An example is included to validate the proposed method. This method helps the decision maker to select the best technology that meets the requirement.

*Keywords:*Reverse Logistics;Multicriteria Decision Making;AHP Method

1. Introduction

   Due to the growing environmental legislations, more attention is given to Reverse Logistics. Reverse Logistics (RL) is the process of planning, implementing and controlling the efficient, cost effective flow of raw materials, in –process inventory, finished goods and related information from the point of consumption to the point of origin for the purpose of recapturing value, or proper disposal [1].The study of reverse logistics is in exploration stage. Cost reduction is possible in reverse logistics. A reverse logistics defines a supply chain that is redesigned to efficient manage the flow of products or parts designed for remanufacturing, recycling or disposal and to effectively utilize resources [2].The various functions executed through RL activities include gatekeeping, compacting disposition cycle times, remanufacturing and refurbishment, asset recovery, negotiation, outsourcing and customer service [3].In

   * Corresponding author. Tel.: +91 98 944 71176; fax: +91 4549 278791.
   E-mail address: itssenthil@yahoo.com

addition to disposition and transportation, value added services such as JIT, quick response and program solutions are also important functions in reverse logistics.

Recovery of products for remanufacturing, repair and recycling can create profitable business opportunities [4]. For managing the returns, the companies can reuse them, resell or destroy them. Retailers may return the goods due to seasonality, expiry or because of transit damage. Customers may return the goods due to poor quality. Managing the product returns increases the customer service level and retention level.

Each activity from procurement to distribution generates waste and reduction of this waste is a major goal of environmentally conscious business practices [5]. Manufactures see reverse logistics as a process of recovering defective products or reusable containers back from the user. In the e-commerce since buyers need assurance for refund, reverse logistics is an important issue. Owing to RL's interdisciplinary approach, this area present an opportunity for research.

A conceptual framework for managing retail reverse logistics operation is presented in [6].In the case study conducted by [7], three companies were visited and identified reverse logistics process flow and the strategic issues a firm may use for competitive advantage. An integrated forward logistics multi echelon distribution inventory supply chain model and closed loop multi echelon distribution for the built to order environment was designed using genetic algorithm and particle swarm optimization [8].A model for green supply chain management with incomplete information was developed [9].Reverse logistics was suggested as an area for future research and the advantages of soft computing is its capability to tolerate imprecision, uncertainty [10].A mathematical model for the design of Reverse Logistics network design was proposed[11,12,13]considering the location and allocation of facilities. A dynamic model was constructed and validated the same using the data collected from the computer company [14]. A distribution system which uses a combination of manufacturing and remanufacturing was proposed and the models were compared with respect to the various prices [15]. From the above references, studies have been done for the RL network design and the selection of third party logistics provider. But AHP and Fuzzy TOPSIS has not been used by any researcher for selection of RL operating channels selection.

The companies can choose three operating channels for performing the RL activities a) Manufacturer collecting the used products-Manufacturer Operation (MO). The manufacturer should control human resources, information systems and related equipment. b) Retailer will collect the used products- Joint Operation (JO). c) Outsourcing to third party-Third Party Operation (TPO). Remanufacturing costs may be reduced by third party. Since the third party logistics is using his latest technology and resource sharing advantages, uncertainty of recovery may be reduced. By outsourcing reverse logistics activities, the organizations can concentrate on their core business operation, but customer satisfaction and delivery performance may be improved[16].Third party reverse logistics provider will compete with each other in specific areas like price, quality and credit. Logistics costs will be reduced and order fill rate will be improved.Each channel has its distinct characters and suitable for companies with their sole service requirements.

Evaluating and selecting reverse logistics channels is regarded as Multi criteria decision making (MCDM) process in which a decision maker chooses the best option among the existing alternatives. This paper is organized as follows. Section 2 describes the problem and in section 3 an overview of method is given. Application of the model to a case study is given in section 4.Section 5 concludes the study and summarizes its findings.

2. Problem Definition

Reverse Logistics can be applied to wide variety of industries like automobile, electronic, chemical and computer manufacturers. Automobile companies recover the end of life auto parts. Electronic products that contain hazardous materials are disposed. Reverse Logistics may take place through