A Framework for Design of Reverse Logistics Systems: A Warehousing Perspective

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ABSTRACT

This paper considered and analyzed the current state of literature in warehousing. The research methodology used was exploratory case study research. The data were collected by use of two in-depth case studies chosen from two different industries. The analysis of the case studies resulted in the development of subfactors, propositions, and insights regarding RL operations. Based on all of these, a framework for effective design and implementation of RL operations was provided. This framework determines the appropriate warehousing subfactors and how the return process of products/parts works. In conclusion, the managerial implications and future research directions were provided.

Reverse logistics, RL framework, warehousing, case study, and exploratory case study research.

INTRODUCTION

Reverse Logistics (RL) is the process by which products are returned from consumers or customer service centers for the purpose of gaining their value or planning for their proper disposal. The RL process is inherently a value added activity in which the values of previously shipped parts, materials, and products are recaptured. The RL system should be accomplished systematically and efficiently for the RL operations to be effective. The RL operations, therefore, add significantly to the value chain by considering the reverse flow that is capable of adding value to the products and generating a competitive advantage for companies.

RL activities could encompass retailers, manufacturers, and service entities. RL has received a great deal of attention from operations managers as well as the highest level of company executives. RL has significant economic, environmental, managerial, regulatory, and strategic implications for organizations that embark on it. RL could open new markets that were not envisioned previously. Additionally, the nature of RL activities cuts across several functional areas such as marketing, operations, logistics, distribution, and transportation. Other areas such as finance and accounting, customer services, quality and reliability, purchasing and design/engineering could also become heavily involved in the RL process. Due to RL's interdisciplinary and cross-functional nature, as well as its many significant implications, this area presents a fertile and interesting research area in the field of supply chain management.
There are many estimates that highlight the significance of RL operations and its various facets. MBT (2007) estimated that up to $100 billion in products move through the RL pipeline each year in the U.S. The average return rates ranging from as low as three percent to as high as 40 percent, depending on the industry. Blanchard (2007) estimated that product returns cost U.S.

manufacturers and retailers $100 billion every year in lost sales, transportation, handling, processing, and disposal. The author further stated that customer returns could reduce a manufacturer's profitability by an average of 3.8 percent and RL costs is nine cents of every sales dollar. Langnau (2001) stated that over the next few years, analysts predicted that the average cost per product return would be $30-$35. Robbins-Gentry (1999) stated that customer returns were estimated at six percent of the overall sales and may be as high as 15 percent for mass merchandisers and up to 35 percent for catalogue and e-commerce retailers. Trebilcock (2001a) stated that across all retail operations, more than 100 million parcel packages a year were returned at a total cost of more than $150 billion. Stock (2001) mentioned that RL costs in the US were about $35 billion per year, or four percent of total logistics costs.

RESEARCH QUESTIONS, SCOPE OF THE STUDY, AND RESEARCH METHODOLOGY

The objective of this study is to identify subfactors associated with warehousing that are necessary and critical for effective design and implementation of RL operations through the use of case studies. This paper, therefore, addresses two main research questions. First, *what* are the critical warehousing subfactors needed in developing effective RL operations? Second, *how* should a firm use these subfactors and the insights gained for the management and implementation of returned parts/products?

The scope of the study includes RL decisions as they pertain to warehousing of products in manufacturing companies (and not retailers, services, or third party RL providers). Further, the focus of this study is on warehousing in RL. Products, for the purpose of this study, are classified as hazardous or non-hazardous, mechanical, consumer goods, and durable or disposable. Additionally, the scope of RL in this paper is on remanufactured products for manufacturing entities for which the returned products constitute a part of their overall business.

The research methodology utilized in this study is "exploratory case study research." This study is applied and the case studies are exploratory where a number of propositions are formulated and evaluated. For further study in case study based research, see Yin (1993, 1994) among many other references.

REVIEW OF LITERATURE

The detailed review of literature in this study focuses on warehousing that is necessary in the understanding of overall RL systems and their implementation. This focus does not exist in the available literature. This study has conducted a review of literature to identify common themes in warehousing that many practitioners and academicians view as essential for designing and implementing RL systems.

Warehousing Operational factor. The re-entry of products/parts in a RL system redefines and restructures traditional warehousing functions and operations. Warehousing serves a dual function. The duality of functions means that warehousing facilities must be capable of both shipping finished products (forward logistics) and receiving returned products/parts products (reverse logistics). The utilization of existing warehousing capabilities such as storage space, labor, equipment, and operational methods can significantly enhance the effectiveness of the RL system.

MBT (2007) clearly focused on the level of coordination required for after-sales activities. One major area mentioned was the role of warehousing in RL. Trebilcock (2002a) and Byrne (2002) stated that the use of in-house warehousing versus outsourcing the warehousing function continues to be a challenge for RL operations. The author seems to suggest that the trend is toward third party and public warehouses. The author further stated that warehousing, due to its nature, cuts across several different functions in many organizations. Harrington (1998) discussed the new role of the warehousing function. The author stated that a warehouse is not for just storing goods. It is to handle integrated flow processes within a company's internal supply chain. Muroff (1993) outlined the hidden costs associated with operating warehouse as they relate to RL or other value-added services. The author noted that 80 percent of warehouses in the United States lose some money in the effective and efficient utilization of the resources in their warehousing system.

In terms of warehousing technologies, Caldwell (1999) and Cooke (1997) focused on the importance and advantages of using computer technology and proprietary software to manage the process of handling returned goods in warehouses. The authors cited a company in which it used to take months to sort shipments that came through its warehouse. This practice has now been reduced to minutes. Zikopoulos and Tagaras (2008) also considered the effectiveness of sorting procedures characterized by limited accuracy just before disassembly and remanufacturing of used products. The author further developed a two-level reverse supply chain with a remanufacturing model.

Schwartz (2000) stated that controlling the material flow of returned items, by careful space planning inside the warehouse, is one of the key components to executing a RL program. Trebilcock (2002b) stated that warehousing systems should provide visibility and functionality in order to reduce the risk of higher inventory carrying costs and obsolescence. Also, Murphy (1986) stated that private warehousing was popular for RL due to its convenience and reliability.

CASE STUDIES AND RESEARCH PLANS

The case methodology used in our paper is an exploratory case study in which a number of propositions are evaluated. Although a single case study is suitable for this study, two companies, an automobile electronic components company (Co. 1) and a medical instrument manufacturer company (Co. 2), were selected for an in-depth analysis and evaluation of the propositions. For owners of older automobiles in need of repair, a remanufactured part can represent a lower-cost, lower-risk alternative to new parts. Compared to buying a new part, the remanufactured parts also represent a potential benefit for customers who pay less, manufacturers who earn more, and the environment, as fewer new resources are consumed. According to Seitz and Peattie (2004) Americans buy approximately 60 million remanufactured automotive parts annually. De Poorterre (2003) also estimated that the aftermarket share of remanufactured power steering racks and air-conditioning compressors to grow from 30 to 80 percent from 2003 to 2008. Further, medical instruments, which are usually very costly and are typically designed for a single use, are good candidates for remanufacturing operations. The findings by Heese *et al.* (2005) in a medical instrument company suggested that by taking back and reselling refurbished products, a manufacturer could increase both profit margins and sales to the detriment of a non-interfering competitor.

ANALYSES, FINDINGS, AND ASSESSMENT OF THE RESULTS

The detailed analyses, findings, assessment of the results, framework, managerial implications, and future research directions are available upon request from S. Dowlatshahi.

REFERENCES

Aichlmayr, M., 2000. "Logistics conquers a brave new world." Transportation & Distribution, vol. 41, no. 8, pp. 29-36.

Andel, T., 1995. "There's power in numbers." Transportation and Distribution, vol. 36, no. 8, pp. 67-68.

Blanchard, D., 2007. "Supply Chains Also Work In Reverse." Industry Week, pp. 48-49.

Brockmann, T., 1999. "21 warehousing trends in the 21st century." IIE Solutions, vol. 31, no. 7, pp. 36-40.

Byrne, P. M. 2006. "Supply Chain Outsourcing: More Choices, Tougher Decisions", Highland Ranch: May, vol. 45, no. 5, pp. 24-25.

Caldwell, B., 1999. "Reverse logistics." Information Week, vol. 729, April, pp. 48-56.

Cooke, J.A., 1997. "Ground zero." Logistics Management. Highlands Ranch: vol. 36, no. 5, pp. 61-62.

Cruz, M., 2001. "IM-Logistics unveils new benefits." CRN, vol. 945, pp. 63-64.

Dawe, R.L., 1995. "Reengineer your returns." Transportation and Distribution, vol. 36, no. 8, pp. 78-80.

De Poortere, E., 2003. “Remanufactured Products: A Clear Opportunity for the European Aftermarket.” Automotive Parts Rebuilders Association Symposium, Amsterdam, The Netherlands.

Del Franco, M., 1999. “Six cost-cutting tips.” Catalog Age. New Canaan: vol. 16, no. 1, pp. 47.

DiMaggio, J., 2000. “Reverse psychology.” Warehousing Management, vol. 7, no. 4, pp. 30-32.

Ellram, L., 1996. “The use of the case study method in logistics research.” Journal of Business Logistics , vol. 17, no. 2, pp. 93-138.

Fleischmann, M., Beullens, P., Bloemhof-Ruwaard, J.M. and Van Wassenhove, L.N., 2001. “The impact of product recovery on logistics network design.” Production and Operations Management, vol. 10, no. 2, pp. 156-173.

Freese, T.L., 2000. “The dock: your warehouse's most valuable real estate.” Material Handling Management, vol. 55, no. 6, pp. 97-101.

Greve, C., 2003. "Fortify your logistics process." New York, vol. 79, no. 11, pp. 120.

Harrington, L., 1998. “The new warehousing.” Industry Week, pp. 52-55.

Heese, H.S., Cattani, K., Ferrer, G., Gilland, W. and Roth, A.V., 2005. “Competitive advantage through take-back of used products.” European Journal of Operational Research. Amsterdam: vol. 164, no. 1, pp. 143.

Hickey, K., 2001. “Here and there.” Traffic World, vol. 265, no. 40, pp. 21.

Krizner, K., 2001. “Many happy returns are now possible.” Frontline Solutions, vol. 2, no. 2, pp. 23-25.

Langnau, L., 2001. “Winning with returns.” Material Handling Management, vol. 56, no. 3, pp. MHS13-MHS14.

Manufacturing Business Technology (MBT), 2007. “Companies chase success in after-sales services.” Highlands Ranch, vol. 25, no. 2, pp. 11.

Muroff, C. 1993. “Cost-added services.” Distribution, Radnor, Sept. vol. 92, no. 9, pp. 77-79.

Murphy, P.R., 1986. “A preliminary study of transportation and warehousing aspects of reverse distribution.” Transportation Journal, vol. 25, pp. 12-21.

Quinn, J.P., 2005. "Are there ever any happy returns?" Logistics Management, vol. 44, no. 6, pp. 63.

Robbins-Gentry, C., 1999. “Reducing the cost of returns.” Chain Store Age, vol. 75, no. 10, pp. 124-126.

Schwartz, B., 2000. “Reverse logistics strengthens supply chains.” Transportation & Distribution, vol. 41, no. 5, pp. 95-100.

Seitz, M.A. and Peattie, K., 2004. “Meeting the Closed-Loop Challenge: The Case of Remanufacturing.” California Management Review. Berkeley: vol. 46, no. 2, pp. 74.

Stock, J.R., 1998. Development and Implementation of Reverse Logistics Programs. Council of Logistics Management, Oak Brook, IL.

Stock, J.R., 2001. “The 7 deadly sins of reverse logistics.” Material Handling Management, vol. 56, no. 3, pp. MHS5-MHS11.

Thierry, M., Salomon, M., Van Nunen, J. and Van Wassenhove, L., 1995. “Strategic issues in product recovery management.” California Management Review, vol. 37, no. 2, pp. 114-135.

Trebilcock, B.A., 2001a. “Why are returns so tough?” Modern Materials Handling, vol. 56, no. 11, pp. 45-51.

Trebilcock, B.A., 2001b. “Reverse logistics heroes.” Modern Materials Handling, vol. 56, no. 10, pp. 63-65.

Trebilcock, B.A., 2002a. “Return to sender.” Warehousing Management, vol. 9, no. 4, pp. 24-27.

Trebilcock, B.A., 2002b. “The seven deadly sins of reverse logistics.” Logistics Management. Highland Ranch: vol. 41, no. 6, pp. 31-34.

Trebilcock, B.A., 2002c. “A winning formula for reverse logistics.” Modern Materials Handling. Boston: vol. 57, no. 10, pp. 37-39.

Trebilcock, B.A., 2004. “Managing returns with WMS.” Modern Materials Handling. Boston: vol. 59, no. 10, pp. 33.

Whalen, J., 2001. “In through the out door.” Warehousing Management, vol. 8, no. 2, pp. 32-36.

Witt, C.E., 1995. “Distribution: a differentiator in 2000.” Material Handling Engineering, vol. 50, no. 11, pp. 57-77.

Yin, R.K., 1993. Applications of Case Study Research. COSMOS Corporation, Washington D.C.

Yin, R.K., 1994. Case Study Research Design and Methods. COSMOS Corporation, Washington D.C.