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ABSTRACT

This paper studies the relative positions of some selected elements in relations to flexibility and cost factors in information system and logistics design settings. Moreover, this study investigates the extent to which organizations can relate, today, to the importance of information technology in logistics and design for reverse logistics in their operational planning and activities. The findings show the degree of their interest and policies for reverse logistics, and the creation of joint efforts to reduce costs and to increase flexibility.

INTRODUCTION

Recently, manufacturing companies have begun to invest heavily in their logistics operations. They have invested in the process of planning, implementing, and controlling the efficient, cost-effective flow of raw materials, in-process inventory, finished goods, and related information technology from the point of origin to the point of consumption for the purpose of conforming to customer requirements. In particular, Design For Logistics (DFL) - designing a product to function better logistically, by taking into consideration how the product will be handled, shipped, stored, etc. - has received tremendous attention by World-Class Manufacturers (WCM) (Stock, 1998).

The past few years, however, have witnessed the birth and evolution of "customer satisfaction," and flexibility as some of the overall objective of business organization. As a result, many firms have instituted more liberal return policies. Estimates indicate rates as high as 20-30% returns in some industry (Rogers & Tibben-Lembke, 1998). A new concept called "Reverse Logistics" (RL), and its impact on design named "Design For Reverse Logistics" (DFRL), are the industries' answer to minimize the impact of liberal returns policies. RL is defined as the process

of planning, implementing, and controlling the efficient, cost-effective flow of raw materials, in-process inventory, finished goods, and related information technology from the point of consumption to the point of origin for the purpose of recapturing value or proper disposal. This concept is quite different from "Recycling" process - when a product is reduced to its basic elements, which are reusable, or "Green Logistics" - attempts to measure and minimize the ecological impact of logistics activities. The offshoot of RL, DFRL is defined as designing products so that their return flow functions better. DFRL should not be confused with "Design For Disassembly" (DFD) – designing a product so it can be more easily disassembled at end-of-life.

The objective of this research is to investigate the familiarity of the local (Southern California) companies with RL and DFRL and the extent of the usage of information technology and decision support system by them. Of special interest is the relative role of the relevant factors, which may provide a better direction and attention for the firms to allocate funds for investments to improve RL and DFRL activities.

METHODOLOGY AND FRAMEWORK

Figure 1 shows an overall schematic view of the materials, and the dotted boxes identify the different participants and activities that may be involved in reverse logistics. While a comprehensive study of the impact of every participant or activity on the overall reverse logistics cost is a necessity, of particular importance is the collection activity, which can be located at the manufacturer's, a distributor's, a retailer's or all three locations. The physical location of this activity and the level of training of the personnel can have a substantial impact on the overall cost of reverse logistics. Moreover, for effectively integrating the chain of activities listed in Figure 1, an infrastructure change in the existing organization's information system and decision support system is required. A simple survey instrument can render a substantial amount of information about the DFRL and its dependence on the distinctiveness of the product or the redistribution system. But, a good understanding of the RL requires utilization of a comprehensive survey instrument which identifies the relationship between the company return policy and costs with the peculiarities of the flow and activities for the returned items. Based on the aforementioned, a survey instrument was sent to operations managers of 50 Southern California firms (manufacturers, distributors, and retailers), and a response rate of 60% was obtained. The responses were refined through telephone conversations with the managers as was deemed necessary.

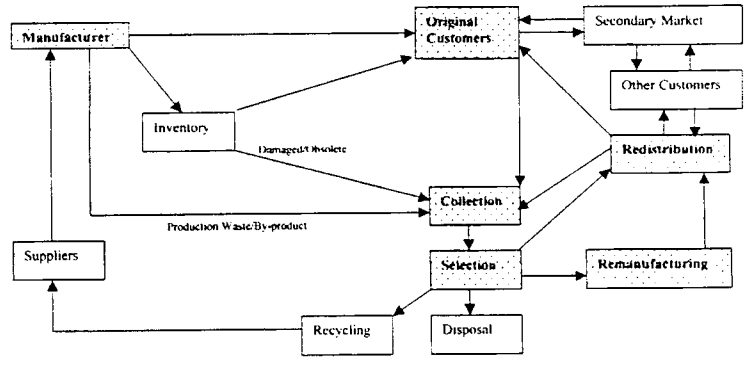

Figure 1. Forward and Reverse Logistics Activities and Flows

RESULTS OF THE STUDY

The purpose of this project was to identify and study some related factors, including the use of information technology, for better establishing and directing a L/RL configuration. The firms responding to the survey were classified in two groups, with and without comprehensive L/RL system, and some of the related elements to cost and flexibility in their systems were compared and tabulated. This study included the responses of 30 firms from different types of organizations (manufacturing, distribution, and retailers) in the Southern California area with follow-up telephone conversations for further refinement of their responses.

Tables 1 and 2 display how different factors are related to the cost and flexibility for the two groups of forms. Each factor in the table is located in a spot that shows its degree of importance to the firms' cost and flexibility. Noticeably, the impacts of the factors are different for the two groups of firms. For example, the cost of L/RL for larger companies without L/RL framework is higher than that for those with a L/RL system. Also, as the two tables show, for the firms without L/RL system the use of new technology (bar codes, computerized tracking, etc.) has less impact on customer satisfaction and flexibility than that for others. That is primarily because of the lack of efficiencies in the process for those without a L/RL system. The results, also, show that DFRL has a significant impact on the firms' flexibility while it reduces the overall cost of operations. Moreover, Table 1 indicates that the in-house return policy is more cost effective for the firms with the L/RL system in place. The information technology, which is the major enabler of L/RL and DFRL, is less emphasized in firms without a L/RL.

Table 1. Factors Affecting Cost and Flexibility in Firms with L/RL

Cost \ Flexibility	Low				High
High			L/RL COSTS		High
			Company Size		
	Outlet Sales/ Salvage/ Donation				Use of Technology
				Remanufacturing/ Refurbishing	Design For RL
Low		Recycle		In-House Return Policy	Centralized Collection Centers
	Low				High

Table 2. Factors Affecting Cost and Flexibility in Firms without L/RL

Cost \ Flexibility	Low		High	
High	L/RL COSTS		COMPANY SIZE	
	Recycle			Centralized Collection Centers
	Outlet Sales/ Salvage/ Donation			
		In-House Return Policy		
Low			Remanufacturing/ Refurbishing	
		Use of Technology		

The responses of the participants were rather mixed about the companies' policies and obstacles in establishing a system for L/RL or DFRL. Often there was a lack of common understanding along the chain of suppliers and producers. That in particular was visible among the organizations without a reliable decision support system. Particularly, the suppliers and distributors weigh the benefits from L/RL and DFRL differently. That came to the authors' attention throughout the follow-up telephone conversations. Distributors were more comfortable with the traditional purchasing metrics related to cost and purchasing price than to an establishment of DFRL and use of DSS. Obviously, this study is revealing the fact that buyers and sellers in most organizations do not yet share the same value for L/RL and DFRL. In fact, the results of the follow-up telephone survey show that they have little in common.

CONCLUSION AND REMARKS

This study explores the practice of L/RL and DFRL through the use of DSS application among the chain of suppliers for reaching efficiency in cost and customer satisfaction. The findings show that the L/RL and DFRL are not yet fully operationalized among the tiers of the supply chains. That is, primarily due to the existing lack of recognizing the common benefits for having

L/RL and DFRL and the absence of a reliable information system. This lack of understanding is more visible among the distributors and the sellers. Also, there is a visible fear among the smaller companies to use the information technology (the major enabler of L/RL and DFRL) to establish the needed framework. The results of this study reaffirm the notion that firms yet need to put more emphasis on long-term planning than on tactical ones. The smaller firms, it seems, are still reluctant to share key information, which is required for L/RL and DFRL, and focus their attention on more conservative return policies. The results of this study show that the larger firms have more liberal policies for returns, and are more open to creating joint efforts to reduce costs and increase flexibility. Perhaps, the fear of competition and insecurities among the smaller firms may explain their conservatism in their return policies.

This study also shows that the obstacles to DFRL, in addition to the above, are the shrinking products life cycle, the increase in customer demand for product variety and the lack of understanding the fundamental needs for the establishment of a reliable DSS. Organizations, in the survey, reiterated in their follow-up telephone conversations that this new trend has added to the complexity of their planning for L/RL and DFRL. Obviously, this complexity can be eased through standardized processes, standardized parts, and more effective common part numbering. But, the lack of sharing common vision or reacting to the same set of interests can be detrimental to any attempt to create a system for L/RL.

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