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Antecedents to and outcomes of reverse logistics metrics ☆

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ABSTRACT

Business to business reverse logistics processes are shaped in large part by a firm's strategy to meet regulatory (e.g. waste electrical and electronic equipment directive) and certification (e.g. ISO 14000) requirements. Firms adopt both recommended and internally developed reverse logistics metrics in order to monitor the performance of these processes along the entire value chain, and especially amongst both buyer and supplier marketing interactions. Unfortunately, literature regarding antecedents to and outcomes of reverse logistics metric development is scarce, leaving industrial marketing professionals with limited guidance as to how to establish and gain value from a sophisticated metric program. This study uses goal-setting theory and the knowledge-based view to conceptualize a model that examines transactions from the perspective of both the supplier (inbound reverse logistics) and customer (outbound reverse logistics) in a business to business context. This granular view reveals how actors occupying different supply chain positions manage collaborative marketing processes such as reverse logistics. Survey data were gathered from organizations affiliated with the United States Department of Defense supply chain and hypotheses were tested using partial least squares structural equation modeling. The results corroborate the assertion that information support capabilities and stated goals are antecedents to establishing metrics; however, the study uncovers outcome disparities between inbound and outbound reverse logistics processes. As the roles of both suppliers and customers in complying with take-back regulation continue to grow, the findings of this study provide marketing professionals and scholars with important insights regarding the use of reverse logistics metrics.

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1. Introduction

Firms rely on effective and consistent supply chain management processes, systems, and metrics in order to keep costs down and remain competitive (Closs, 1989; Mondragon, Lalwani, & Mondragon, 2011). Lambert and Pohlen (2001) identify factors that underlie the need for metrics specific to supply chain applications and a variety of other studies have identified and discussed such metrics (Gunasekaran & Kobu, 2007; Gunasekaran, Patel, & Tirtiroglu, 2001; Kleijnen & Smits, 2003). Although several reverse logistics metrics have been proposed in the literature (Stock & Mulki, 2009), investigation of the antecedents to the establishment of these metrics and the outcomes realized via instituting such metrics has not been well examined in the marketing and supply chain management literature and is almost entirely absent in the reverse logistics literature. Given the proliferation of take-back regulation, an emphasis on sustainable marketing and logistics practices, and business' endless desire to enhance efficiencies, the need for firms to use reverse logistics-specific metrics is increasing. In this study, we investigate antecedents to the establishment of reverse logistics metrics as well as whether or not these metrics can ultimately help to reduce reverse logistics costs.

In this paper, reverse logistics is defined as "…the movement of goods from a consumer towards a producer in a channel of distribution" (Pohlen & Farris, 1992, p. 36). Notably, this paper investigates reverse logistics from the business-to-business marketing perspective. In this arena, it is critical for marketing managers to liaise with their logistics counterparts to ensure effective processes and customer satisfaction. In this regard, reverse logistics activities affect several functions across an enterprise, to include logistics, marketing, operations, and others. Appropriate metrics can help to shape communication and coordination across functions. For instance, reverse logistics metrics might help to enable the production function's support of marketing initiatives, or help to inform marketing professionals with regard to supplier selection and retention.

In a business-to-business environment, reverse logistics processes are often encompassed within a closed-loop system (Sarkis, 2012). That is, products first flow outbound to a customer (forward logistics); those same products then flow back inbound, often in an altered state

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or condition (reverse logistics) (Jayaraman & Guide, 1999). Therefore, examination of the reverse logistics process may be complicated by the fact that each organization within the closed-loop system serves two functions; organizations that are "senders" in the forward logistics process become "receivers" in the reverse logistics process, and vice versa. Because of the inherent differences between inbound and outbound logistics processes (Stock & Lambert, 2001; Svensson, 2002a, 2002b), it follows that the antecedents to and outcomes of metrics may be dependent upon the organization's function within the return transaction.

Most of the reverse logistics research considers only the perspective of the organization that is receiving returns from its customers. Although investigating this perspective is important to helping firms understand how to manage their own returns and associated processes, it must be noted that, as with most processes within the supply chain, multiple stakeholders are involved in reverse logistics processes (Olorunniwo & Li, 2010). Due in part to growing regulatory and societal pressures to adopt environmentally sustainable practices, the need to examine both the supplier's *and* the customer's role in reverse logistics is becoming increasingly important. Although of little consequence prior to the 1960s (Murphy, Poist, & Braunschweig, 1995), environmental concerns have evoked a variety of regulations in recent years that significantly affect marketing and logistics processes (McKinnon, 2012; Murphy et al., 1995). For instance, the United Kingdom's Environment Agency Landfill Directive "pre-treatment" requirement dictates that producers of waste take steps to reduce the amount and impact of non-hazardous waste, often requiring material to be returned to the supplier or other entity for disposition, and the European Community's waste electrical and electronic equipment (WEEE) directive requires collection, recycling, and take-back of electronic equipment that necessitates additional transactions after the initial sale to ensure proper disposition (Cherrett, Maynard, McLeod, & Hickford, 2012). The United States is also taking steps to adopt similar regulation. Although there is currently no federal-level legislation similar to WEEE, we found that 25 states have passed legislation requiring electronic waste recycling to some degree. While many of these laws assign responsibilities to suppliers, the customer is still required to participate and, in some states, the onus is entirely upon the customer to comply. The aforementioned regulation is reshaping marketing relationships between suppliers and customers and necessitates more in-depth examination of expanding responsibilities of both parties.

Considering the preceding discussion, this study considers the antecedents to and outcomes of a reverse logistics metrics from two perspectives. We examine metrics from the perspective of the organization that is receiving the returned product. We term this perspective "inbound." We also examine metrics from the perspective of the organization that must return the product and wait for a replacement or credit. We term this perspective "outbound." Although we separate the reverse logistics process into inbound and outbound components, it should be recognized that most organizations within a supply chain will inevitably assume both functions. However, our point is that additional insight may be gained by decomposing the reverse logistics process into these two functions in order to provide a more focused investigation of each function and glean more actionable information for marketing and logistics managers.

Our investigation into reverse logistics metrics is motivated by the following questions: What are the antecedents to establishing metrics for reverse logistics? Does establishing reverse logistics metrics enhance reverse logistics effectiveness? Do the antecedents to or outcomes of metrics differ between inbound and outbound functions? We explore these questions from the perspective of goal-setting theory in combination with the knowledge-based view (KBV) of the firm. In the next section, we use the aforementioned theories as the foundation to build our conceptual model. Then, we go into greater detail to develop the specific relationships presented in our model, which culminates in the presentation of our hypotheses. Next, we describe our survey data collection and partial least squares (PLS) structural equation modeling analysis. We then report our findings and discuss implications for research and practice. This article closes with a short discussion of limitations and additional research opportunities.

2. Conceptual development and hypotheses

Considering previous work regarding conscious goals and the effect of such goals on task performance (Lewin, Dembo, Festinger, & Sears, 1944; Mace, 1935), goal-setting theory is based on Ryan's (1970) assertion that conscious goals affect action. Goal-setting entails the process of establishing levels of performance in order to motivate desired outcomes (Locke & Latham, 2002; Locke & Latham, 2006). The theory has been operationalized at many levels of analysis, to include the individual, group, and organizational levels (Locke & Latham, 2005).

Extant literature has examined several goal-setting conditions. Based on previous literature regarding performance measurement in the supply chain (Griffis, Cooper, Goldsby, & Closs, 2004; Griffis, Goldsby, Cooper, & Closs, 2007), we examine how the conditions of goal specificity (Locke & Latham, 2006) and feedback (Sorrentino, 2006) influence the establishment of metrics. Specifically, we assess stated organizational goals for reverse logistics as a proxy for specificity and information support capabilities as a means by which to acquire feedback. In the context of goal-setting theory, we focus our attention on the establishment of metrics as a surrogate for the operationalization of organizational goals for reverse logistics (Blanchard, Zigarmi, & Zigarmi, 1985; Doran, 1981). Goal-setting has been shown to be both directly and indirectly related to several practical outcomes (Latham & Baldes, 1975), such as measures of productivity (Latham & Locke, 1975), performance (Latham & Kinne, 1974; Latham & Yukl, 1975), and profitability (Terpstra & Rozell, 1994). Research in goal-setting theory posits that there are two paths to achieving such outcomes: one path is motivated by goals and the other path is motivated by other factors that are not necessarily associated with goal-setting (Locke, 2000). However, both paths can be associated with task knowledge (Locke, 2000). In this way, metrics might represent a knowledge-based resource that can be used to complement goal-setting theory and explain how an organization might bridge the gap between goals and performance.

The resource-based view (RBV) of the firm suggests that organizations use rare, valuable, and inimitable resources to create competitive advantage (Barney, 1991; Dierickx & Cool, 1989; Mahoney & Pandian, 1992; Penrose, 1959; Priem & Butler, 2001). The KBV of the firm is an extension of RBV and considers knowledge as a strategically significant resource that can indeed be rare, valuable, and inimitable (Conner, 1991; Grant, 1996; Kogut & Zander, 1992; Spender, 1996); such knowledge may be entrenched within an organization's policies, procedures, systems, and routines. Like goals, knowledge can be thought of as having the potential for influencing action (Carlsson, 2003). Considering knowledge as a capability, knowledge can be seen as the capacity to ascertain and communicate what information is necessary for decision making (Watson, 1999). In order for an individual's, group's, or organization's knowledge to be useful, it must be expressed in a way that is interpretable to others (Alavi & Leidner, 2001). In an attempt to manage and capitalize upon its knowledge, organizations must build an infrastructure consisting of not just a technical (e.g. information) system, but also of networks of people and processes (Davenport & Prusak, 1998).

Literature on the KBV suggests that organizations consist of four knowledge processes: creation, storage/retrieval, transfer, and application (Alavi & Leidner, 2001; Holzner & Marx, 1979; Pentland, 1995). From this perspective, it follows that managerial metrics might provide a mechanism to support both transfer and application processes. In regard to transfer, the establishment of a metric can be seen as a formal knowledge transmission channel that explicitly informs members of organizational values and goals. A technology-enabled knowledge system