

**Reverse Logistics Planning: A Strategic Way to Address
Environmental Sustainability While Creating a Competitive
Advantage**

Chancellor's Honors Program Thesis

Melissa Rebecca Icenhour

College of Business Administration
Department of Marketing and Supply Chain Management
The University of Tennessee, Knoxville
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Thesis Advisor: Dr. Diane Mollenkopf

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Abstract

The purpose of this thesis paper is to introduce the reader to the practice of reverse logistics and address how sustainability and reverse logistics are interrelated.

The field of reverse logistic is becoming increasingly prevalent in supply chain management. The growing scarcity of resources, new regulation, and consumer pressure has created a need for reverse logistics to be at the forefront of many companies' strategic planning models. Yet, few companies have looked at reverse logistics as a strategic planning issue that can create a competitive advantage for them.

This paper examines the relationship between reverse logistics and organizational performance within the context of the business strategies that have been adopted by organizations and shows that an opportunity exists for sustainable development through reverse logistics.

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1. Introduction

Business as usual is no longer an option. Consumers now expect companies to take the lead in transitioning to more sustainable development practices. For many companies, reverse logistics is one answer to balancing environmentally responsible decisions with financial growth while creating a competitive advantage. It provides a means to access untapped revenue streams thorough product recovery (Ryder 2010). Yet, while many companies have recognized the need to use reverse logistics processes, few have strategically examined the opportunity (Moore 2005). Reverse logistics should be incorporated into companies' overall strategy for product lifecycle management in consumer channels. The purpose of the thesis is to address how sustainability and reverse logistics are interrelated.

Reverse logistics is defined as:

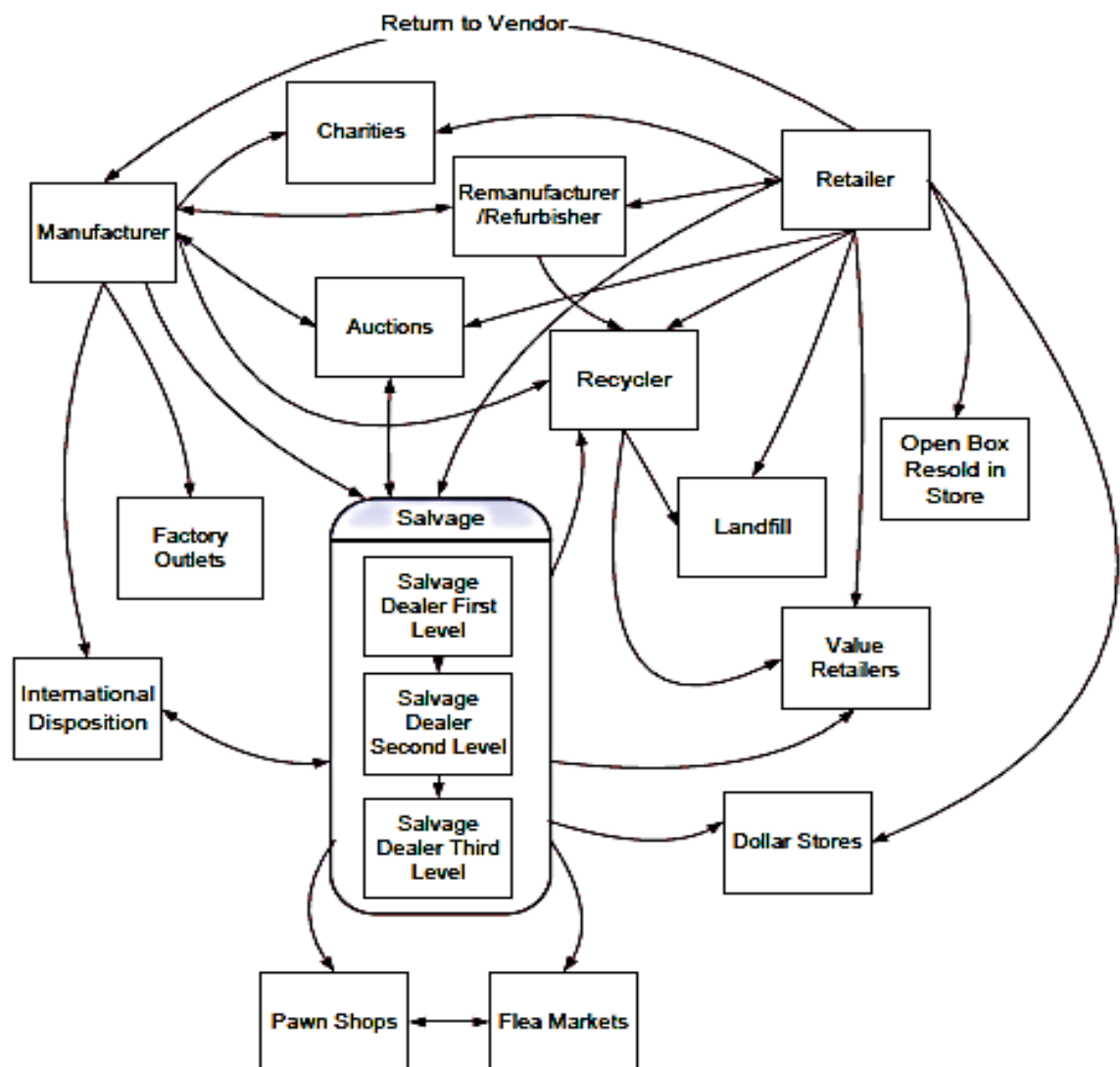
The supply chain that flows opposite to the traditional process of order, fulfillment and customer delivery. It is the combined processes of planning, implementing, and controlling the flow of raw materials, in-process inventory, finished goods, and related information from the point of consumption to the point of origin (Rogers et al. 1998).

However, this definition is an abstract concept. The reverse logistics process is a very complex, cross-functional process. It involves multiple activities across many departments and firms such as customer service, finance, manufacturing, logistics, wholesalers, retailers, and consumers. The process can involve collecting unwanted/end-of-life products, disassembling, refurbishing, recycling, disposal, and redistribution (Ryder 2010). Figure 1 details the many paths a product can take once it enters the reverse logistics flow.

Although, reverse logistics and forward logistics have similar activities, such as transportation, inventory and storage (Huscroft et al. 2013), the reverse logistics flow is very different from the forward flow (Rogers et al. 2012). The reverse logistics flow is more reactive

and with less visibility than normal logistics and is usually implemented in response to actions by consumers (Rogers et. al. 2012). Table 1 summarizes Figure 1 by listing several reverse logistics activities specific to products. The activities identified in Table 1 are dependent on the type of product returned. There are several different types of product returns processed through the reverse logistics pipeline; the process is detailed in Figure 2.

Figure 1: Returns Process Flow Chart



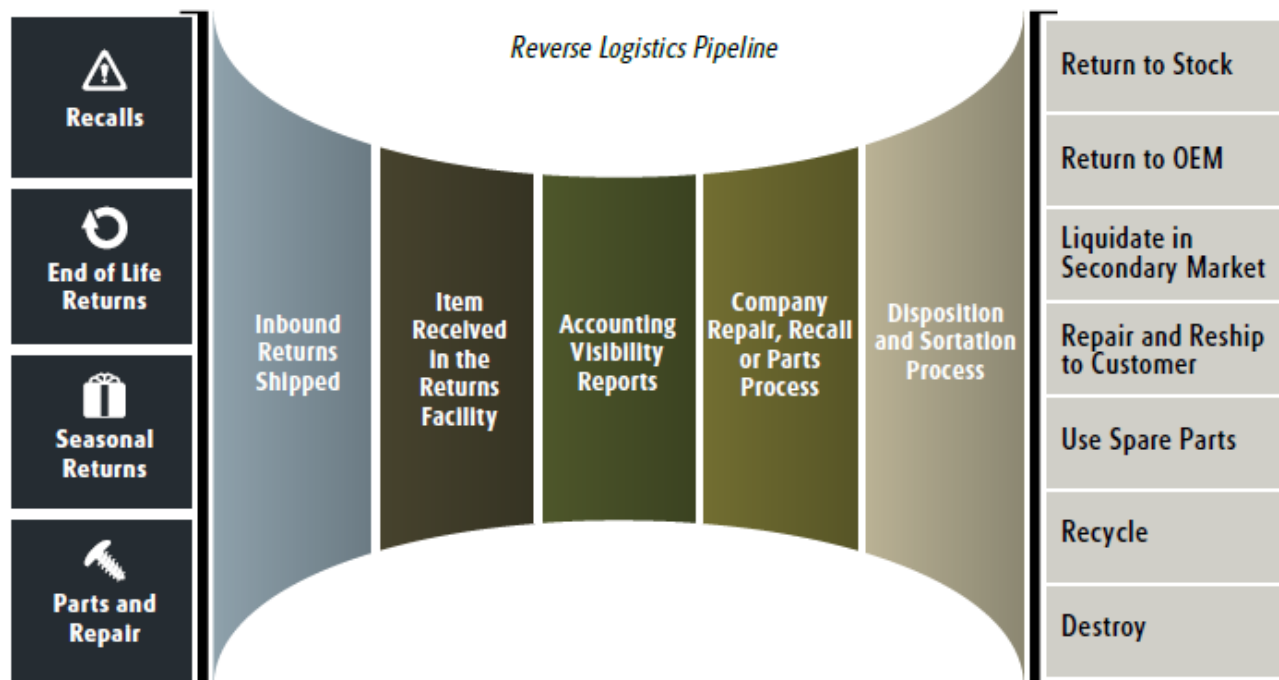
Source: Rogers et al. 2012

Table 1: Reverse Logistics Activities

Material	Reverse Logistics Activities
Products	Return to Supplier Resell Sell via Outlet Salvage Recondition Refurbish Remanufacture Reclaim Materials Recycle Landfill

Source: Rogers et al. 1998

Figure 2: Reverse Logistics Pipeline Activities



Source: Greve et al. 2012

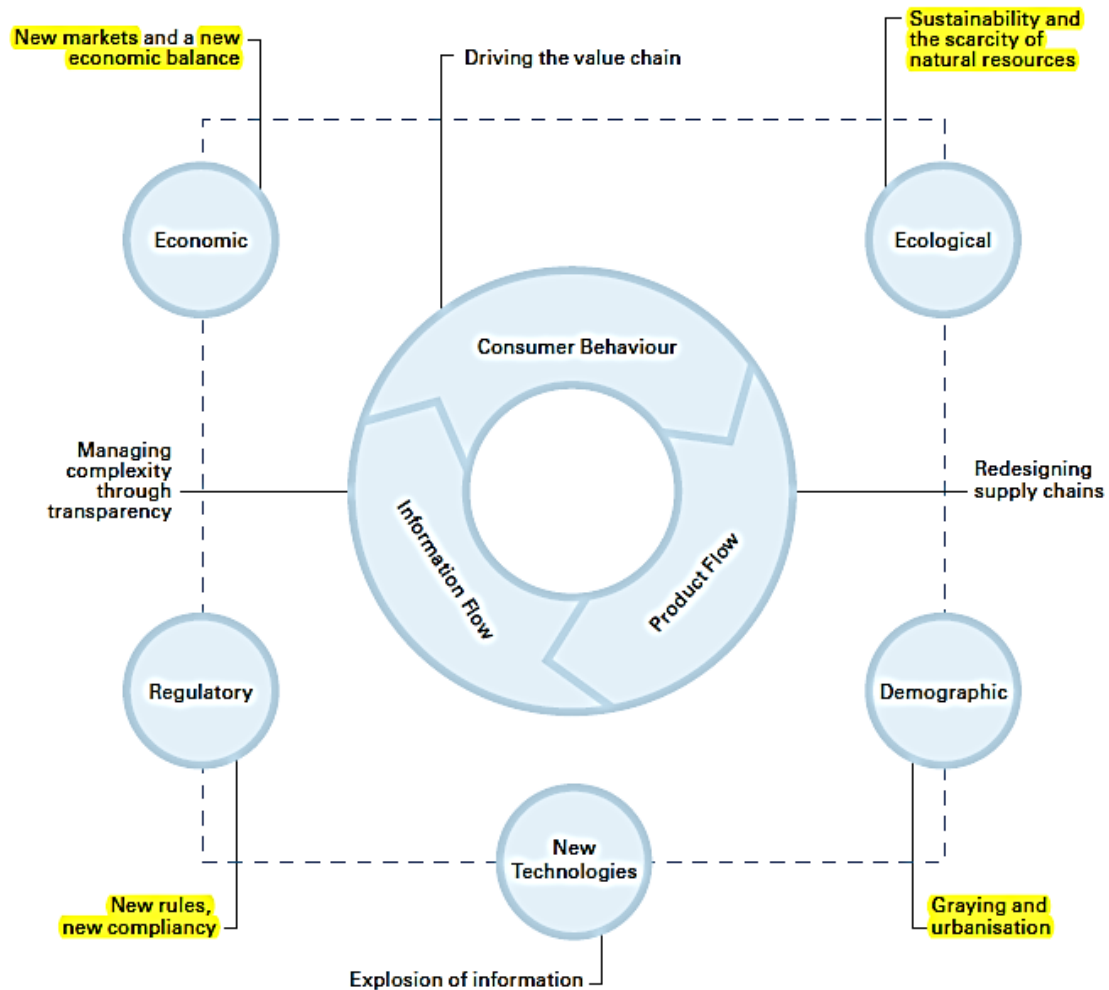
This paper will address how companies can use product returns as a strategic part of their sustainable development strategy. Reverse logistics was named as one of seven solution areas for the 2016 future supply chain, so addressing this topic is timely and implementing it in company

strategy would be proactive (Global Commerce Initiative 2008). However, most companies do not have an effective returns process in place because it is not a part of their core competency (Moore 2005).

This research is important because returns can be a major source of waste in the supply chain. Therefore, returns management can play a major role in sustainable development (Sonneveld 2005). In addition, reverse logistics can have a huge impact due to its long-term financial benefit potential, companies' needs for environmental regulation compliance, and the importance of the environment shown by consumers (Das 2011). Figure 3 shows a visual summary of trends that will affect the future supply chain. External forces impacting the future supply chain will include economic issues, ecological issues, changing demographics, new technologies and regulatory forces. These external forces will have an effect on the future supply chain. This paper will address how industry can be part of shaping the future supply chain around the key industry trend of sustainability (Global Commerce Initiative 2008).

The remainder of the paper is structured as follows. Section 2 reviews the literature on reverse logistics that has informed this study. Section 3 explores why firms should respond to current business and economic trends by strategically developing and implementing reverse logistics. Section 4 delves into how consumers represent both an opportunity and a barrier in the reverse logistics process. Section 5 details how regulations play a key role in successful reverse logistics strategy in a corporate atmosphere with increasing importance being placed on environmental responsibility. Section 6 presents how reverse logistics planning has become a financially and economically viable option for companies. Finally, Section 7 outlines conclusions drawn from the research.

Figure 3: Key Trends in the Future Supply Chain



Source: Global Commerce Initiative 2008

2. Literature Review

A review of recent reverse logistics research is necessary in order to position this supply chain method in the context of sustainability strategies. Reviewing this history also serves to portray how the perception of reverse logistics is evolving. The literature reviewed below falls into either of the two aforementioned categories.

Until the 1990s, supply chains were developed to support processes covering raw material supplies to finished products delivery. However, since about 2000, for economic, legal,

and strategic reasons, manufacturers increasingly have been managing product returns at their end of life and then have designed new business processes, such as reverse logistics. (Thierry et al. 1995). In addition, reverse logistics has recently received a great deal of attention in regards to its environmental impact. It encompasses a total life-cycle view for products in that it incorporates remanufacturing, recycling, and disposal into the supply chain (Abdallah, et al 2012).

Reverse logistics can be used as a strategic method to address the environmental externalities that come from increased production and consumption. Porter and van der Linde (1995) suggest that environmental regulations and the methods used to meet regulations don't have to raise operating costs. Instead, they argue that when companies respond to environmental regulations compliance costs can be off-set through improved resource productivity. This suggests that reverse logistics should be considered as a strategic planning issue.

Current literature also supports the ideas that reverse logistics and green supply chain management overlap. Porter and van der Linde (1995) recognize that there is need for correcting resource inefficiency, specifically in regards to discarded packaging and resources left in used products. The reverse logistics activities of reuse, recycling, and remanufacturing are recognized as functions that green the supply chain (Hazen et al. 2012). Combining these two view-points suggests that reverse logistics may be able to serve as a mechanism for implementing green supply chain practices.

Another factor that makes reverse logistics a key improvement area for companies is the expanding global economy. Schoolderman and Mathlener (2011) show how global increases in population, GDP, and consumption affect the environment in term of resource scarcity. Many of the companies in their study highlight supply chain efficiency and collaboration as essential to

mitigating the risk of resource scarcity. 64% of companies surveyed in the study cited re-use of products as a necessity going forward to maintain a sustainable supply chain. Their conclusion reaffirms that using reverse logistics processes serve the purpose of “going green” and promoting environmentally sustainability.

Reverse logistics is now becoming a more prevalent practice. However, in the past there was very little visibility into the reverse supply chain, and many companies viewed returns as a cost of doing business (Dutton 2010). Companies now realize that they can become more resource efficient if they take materials from returned products and/or used products then recycle, refurbish, and reinsert them into the forward supply chain.

Rogers and Tibben-Lembke (1998) agree that companies can no longer put reverse logistics on the backburner. Yet, the majority of firms have not yet decided to emphasize reverse logistics as a strategic variable. However, that mindset is starting to change. Most firms believe that a satisfied customer is a valuable asset. A major part of satisfying involves taking back customers unwanted products (Rogers 1998).

Das (2011) also espouses that there is a growing interest in reverse logistics on the part of environmentalists and companies alike. He proposes that end of life product recovery eliminates waste and makes companies more resource efficient while establishing an environmentally responsible consumer image. Because of these effects and potential financial gains, companies should implement reverse logistics as a strategic business process.

The aforementioned literature highlights the importance of using reverse logistics in the supply chain to effectively and efficiently respond to current economic and environmental trends. This study will address the role of reverse logistics, specifically product returns, in achieving environmental sustainability and overall supply chain performance objectives.

3. The Need for a Strategic Approach to Reverse Logistics

Strategy integration helps to create additional tangible and intangible competitive advantages for firms in the form of increased customer loyalty, new customers, increased profitability through materials reduction, and improved market share via an environmental image (Jayaraman et al. 2007). Table 2 details several other competitive advantages gained by strategically supporting the reverse flow of products.

Table 2: Competitive Advantages

Tangible Competitive Advantages	Intangible Competitive Advantages
Recovery of value from used products provides a good return on investments and new markets for returned goods.	Philanthropy and goodwill returns can significantly improve a corporate image.
Offering “green” products can help companies retain environmentally conscious customers and employees and producing greener products can lower future liabilities, insurance rates and customer disposal costs.	Feedback information from product returns can provide multiple benefits including feedback on magnitude and uncertainty of return flows and potential markets for various recovery operations
Returned goods can provide detailed insights about merchandising effectiveness, product performance, consumer expectations and product line profitability.	Provides retailers and suppliers opportunity to capture the wealth of information that can be obtained from a returned product.
Policies such as extended return period, return location choice, paid shipping and rapid refunds have all increased growth in both online and offline shopping.	Provides opportunity to gauge customer reaction, opinion and satisfaction regarding the physical attributes of returned products

Source: Jayaraman et al. 2007

To obtain a competitive advantage, companies must have a clear strategy and ability to handle products flows in the reverse supply chain in order to differentiate themselves and leverage product returns as a strategic resource (Jayaraman et al. 2007). However, due to the variable nature of returns, both processes and systems must maintain a degree of flexibility to manage the returns process. Most products are engineered to incorporate manufacturing efficiencies (e.g. postponement manufacturing and modularization), but few product designs take into account disposition (Moore et al. 2005).

Since many firms lack the resources and expertise to efficiently recover returns and manage the disposition of end-of-life products, there is a huge opportunity for companies to capitalize on the aftermarket if they implement an effective returns management strategy (Molinari 2010). The success of product recovery management implementation depends on companies' ability to manage consumer relationships, reduce the environmental impact of used products, recover as much economic value as possible out of used products, comply with legislation, and generate a profit (Thierry 1995).

4. Consumers: An Opportunity and a Barrier for Reverse Logistics Implementation

Consumers are an important link in the reverse flow of products. There must be collaboration between consumer, retailers, and the rest of the supply chain for reverse logistics to be successful (Jayaraman et al. 2007). Customer satisfaction is extremely important to building long term relationships (Brown 2003). It is also good business, because it leads to greater profitability through customer retention and repeat business (Brown 2003). This lends reverse logistics to being a key strategic area for recovering cost and creating competitive advantage on the consumer end of the supply chain.

In 2009, retail returns in the United States amounted to \$186 billion, equal to about 8 percent of total retail products sold by members of the National Retail Federation (Terrerri 2011). However, there is currently little to no value being recovered by companies because many of the returned goods are not successfully repaired, refurbished, or sold on a secondary market (Terrerri 2011). Companies now realize that customers will spend 5 to 20 times the initial sales price on subsequent services and consumables such as repairs, spare parts, and additional new products, making it a financially viable option to offer a full spectrum of product return services (Moore et al. 2005). A case in point is Zappos. Zappos has made returns a core part of their marketing

strategy. Customers can order any shoes, try them on, and then return the ones they don't want for free (Zappos.com 2014). This seamless shipping experience is one reason 75 per cent of Zappos shoppers are return shoppers; after all, Zappos is all about an easy experience and instant gratification (UPS 2014)

In addition, a study by Hazen, Wu, Cegielski, Jones-Farmer, and Hall (2012) suggests that consumers' satisfaction with firms that adopt reverse logistics leads to increased levels of loyalty to the firm. This would in turn lower new customer acquisition costs. The firm would also realize a savings on raw materials in the remanufacturing process. In addition, the adoption of reverse logistics indicated the environmental friendliness of a firm, which satisfies consumers' concern for sustainable development (Hazen et al. 2012).

While there are positives to reverse logistics implementation, there are also barriers. Companies must motivate customers to return products instead of disposing them and increase the probability that consumers will make multiple returns which is easier said than done (Das 2011). Several examples of motivation techniques include: incentivizing returns with certificates or coupons for returning packing/packaging material, providing replacement products at a discount price for returning end of life products, or paying customers a cash amount equivalent to 25-30% of the recovered product price for returning products that meet prelisted conditions (Das 2011).

Another barrier is that many companies are reluctant to implement a product recovery system because there are costs involved in the returns process. These costs include: collection/storage costs at retailer, transportation from retailer to manufacturer, transformation of products from unsalable to salable (this involves refurbishment, repair, or recycling), and redistribution of saleable products (Das 2011). Firms must weigh the upfront costs of

implementing a returns program against potential revenue generated via sales on the secondary market (Das 2011).

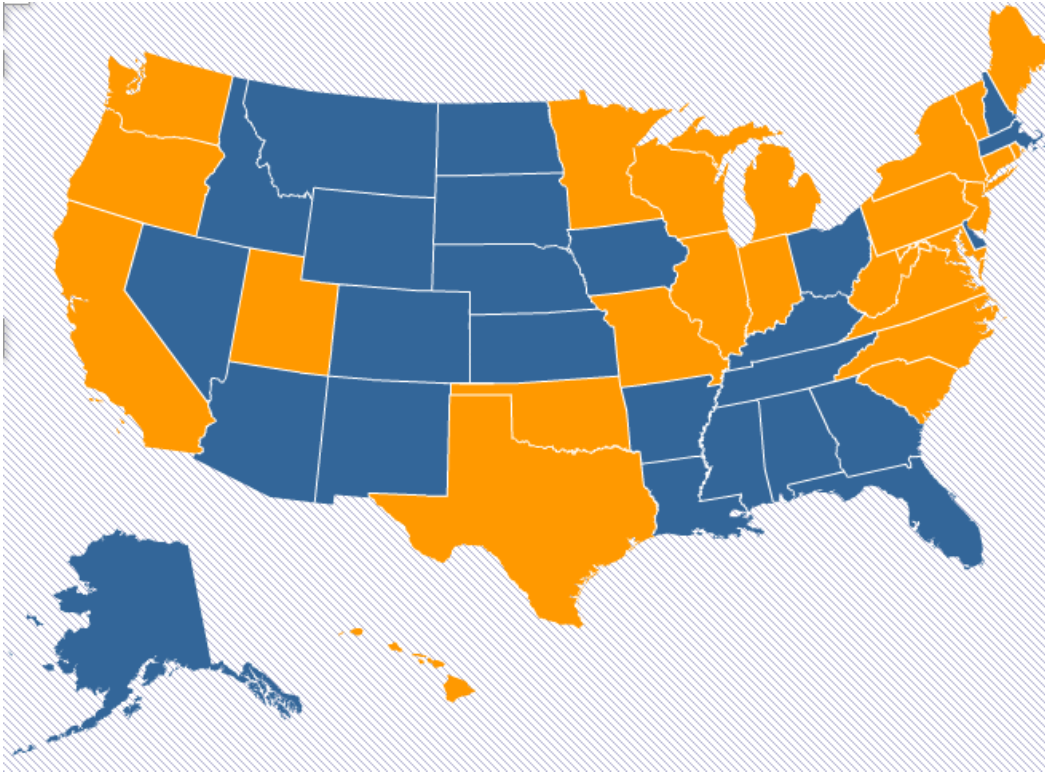
5. Environmental Regulation Compliance and Reverse Logistics

In addition to consumer pressure, reducing waste has become a priority for lawmakers wanting to preserve the environment for future generations (Molinari 2010). In many states, part of supporting sustainability initiatives means addressing end of product life management issue such as waste streams going to landfills. A case in point is electronic waste “E-waste” legislation. The WEEE in Europe and State E-waste laws passed in the United States have sent strong messages that this issue is a serious one that cannot be ignored. (Lee 2008).

With electronic devices continually entering and exiting the marketplace, manufacturers and retailers have an opportunity to decrease waste through reverse logistics for end-of-life devices (Molinari 2010). Regulation is a mechanism that encourages companies as well as their supply chain partners to behave in an environmentally responsible manner (Lee 2008). There are currently 25 states with e-waste laws shown in Figure 4. States highlighted in **orange** have passed some type of e-waste legislation.

Across the board, the laws are generally limited to the return of computers, monitors, printers, computer peripherals and TVs. In 24 states, the E-waste laws place the burden for disposing of E-waste in the state on manufacturers. Programs vary by states, but in general, manufacturers must pay fees to cover the costs of recycling e-waste or must provide a recovery program at no cost to the consumer (Electronics Recycling Coordination Clearinghouse). The one except to the rule is California's Electronic Waste Recycling Act of 2003, which charges consumers recovery fees of up to \$10 at the point of purchase (Tom 2005).

Figure 4: Map of States with E-Waste Legislation



Source: Electronics Recycling Coordination Clearinghouse

Proactively managing returns makes it easier for companies to deal with regulatory issues and evaluate returned stock for possible secondary sales channels (Greve et al. 2012). There are also other beneficial byproducts to disposing of products, such as avoiding excess inventory carrying costs, minimizing taxes and insurance, and managing staff levels (Greve et al. 2012).

It is evident that businesses are forced to respond differently in today's business environment due to these increased environmental standards and regulations. In addition, CEOs are now measuring their business success by encompassing their companies' sustainability footprint and environmental performance (Lee 2008). How companies choose to respond to regulation can result in a competitive advantage or disadvantage (Jayaraman et al. 2007).

However, to fully evaluate a company's effectiveness, there needs to be new key performance indicators that address not only efficiency but sustainability (Global Commerce

Initiative 2008). Figure 5 details some traditional KPI's and also lists new KPI's that could be measured.

Figure 5: Future KPI's Needed for Supply Chain Evaluation

Current KPIs	Sustainability KPIs
Availability to consumer (percent in-stock)	Energy consumption
Cost reduction	CO ₂ emissions (greenhouse gases)
Financial KPIs	Traffic congestion
▪ Return on investment (ROI)	Water consumption
▪ Gross Margin Return on "X" (GMROX)	Security compliance
▪ Return on brand equity	Infrastructure simplification
▪ Inventory	
Traceability	

Source: Global Commerce Initiative 2008

Reverse logistics can be used to help companies comply with increasingly stringent environmental standards especially when it comes to product returns and waste disposal. Since the returns market is still very underdeveloped compared to the forward supply chain, there is real strategic value in reverse logistics management in terms of reducing waste and recovering value.

6. Bottom Line Impact

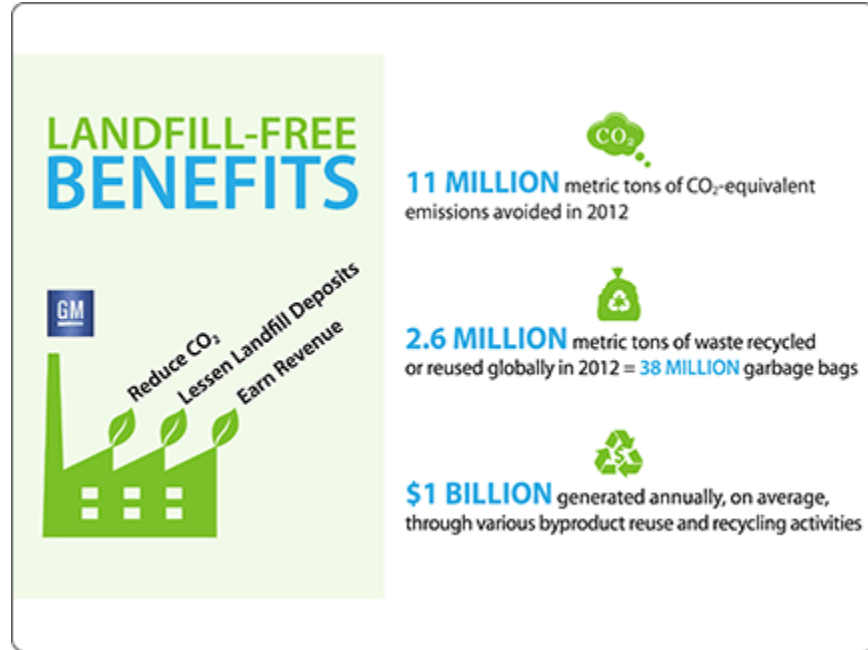
Reverse logistics also presents economic and competitive opportunities for companies because it creates additional sales by offering refurbished products on the secondary market and reduce expenses by reusing some parts and components in the remanufacturing process. Reverse logistics activities such as remanufacturing represent a cost effective strategy. In general, 70% of the cost to build something new is in the materials and 30% of it is in the labor; when remanufacturing, the material cost is only 40% (Jayaraman et al. 2007). It is also estimated that reverse logistics costs account for almost one percent of the total United States GDP. In addition, a recent survey of 125 product manufacturing firms estimated that 50-70 percent of companies' total potential revenue from the average product lifecycle is unserved (Moore et al. 2005).

Therefore, reverse logistics should become an integral component of retailers' and manufacturers' profitability and competitive position (Moore et al. 2005).

A real world example of how implementing reverse logistics can lead to bottom line profitability is T-Mobile USA, Inc. In 2008, T-Mobile reevaluated their waste strategies and decided that the company was ineffectively repurposing cell phones. The company ended up increasing the amount of refurbishing done to existing phones by strategically working with suppliers to create a new product line of refurbished devices. The transition of units to from November 2009 to June 2011 led to a \$363 million in savings for T-Mobile (Arnseth 2012). In addition, customer demand for refurbished phones rose, creating a new untapped market (Arnseth 2012). Finally, their supplier acquisition cost savings amounted to \$25 million per year (Arnseth 2012).

Another example of a company that has incorporated product lifecycle management into its overall strategy is GM. The world's largest automaker has 110 landfill free facilities, recycles or reuses 90 percent of its waste, and its vehicles are on average 85 percent recyclable at the end of their useful life (General Motors Company). The company collaborates with the vehicle dismantling industry to ensure that the majority of vehicle materials are salvaged and can be recycled or reused in new vehicles or other consumer products at the end of the vehicle's life (General Motors Company). Even more impressive is the \$20,000 a month off of cardboard recycling and the \$1 billion per year it generates from selling scrap (General Motors Company). Additional sustainability metrics are detailed in Figure 6. The company's 90 percent recycling rate is not a liability, but a profitable asset. GM and T-Mobile's successes in implementing return channels are prime examples that environmental decisions don't have to be at odds with financial performance.

Figure 6: Benefits of Recycling and Reuse



Source: General Motors Company

7. Conclusion

The aim of this paper is to contribute to the growing body of literature about the opportunity for sustainable development through reverse logistics. It brought to light a critical challenge that the supply chain industry will face in the coming years. Companies will need to serve customers in a sustainable way while positively impacting the bottom line.

The reality is that a good reverse logistics program can be a differentiator and a means of gaining market advantage because it allows for better resource utilization in existing distribution channels (Jayaraman et al. 2007). It can be concluded that a supply chain model, which integrates reverse logistics, can present an opportunity for companies to simultaneously meet the objectives of sustainable development while achieving financial benefits through savings and revenue generation. When companies understand the financial, environmental, and social opportunities that reverse logistics offers, they can create a distinctive competitive advantage.

How companies choose to address environmental responsibility, whether it be through proactive legislation compliance, maintaining a positive company image, or meeting consumer expectations, ultimately their actions will be where the competitive advantage comes from.

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