Impact of Business Process Reengineering of Reverse Logistics for Improving Supply Chain Performance: A Conceptual Framework from a Systematic Review of Literature

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Abstract
Today businesses are dealing in a competitive global structure and thus, force them to be more focused on their every strategy followed in supply chain management in order to be more competitive and successful. As a consequence, reverse logistics has captured the attention of the businesses in order to improve the customer satisfaction and to improve the supply chain performance. It's a proven fact that reengineering business processes of supply chains pave the way for improving efficiency and productivity of the supply chains. Accordingly, this scrutiny is to find out the effect of business process reengineering on the reverse logistics process of businesses and thereby how it affects for the supply chain performance. This study presents the findings of a comprehensive and systematic review of literature and subsequently presents a conceptual framework for the methods used in reengineering the reverse logistics and how it affects the supply chain performance. The article will provide an insight to current state of knowledge available in the respective area and will set up the path for future research.

Keywords
Business process reengineering, Reverse logistics, Supply chain performance

1. Introduction

Reverse Logistics (RL) has gained increasing attention in recent years as a channel for companies to attain operational performance. It involves handling of returned materials or products which holds a major point in sustainable development throughout the whole supply chain. For better control and management of these activities new approaches and information support systems have to be proposed with a new organizational system. Thus, process re-engineering may need to be carried out where it requires a careful and detailed strategic planning. (Chan, 2010) However, the product returns/RL are heavily driven by the customer returns and vary in volume according to the industry.

The generally accepted definition of Reverse Logistics is "the process of planning, implementation 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 or creating value or proper disposal" (Rogers & Tibben-Lembke, 1999). Reverse Logistics has become one of the most significant trends in supply chain management through the recognition of the strategic importance of reverse logistics operations, which can contribute for 5-6% of the total logistics costs (Retzlaff-Roberts and Frolick, 1997; Handfield & Nichols, 1999; Daugherty et al. 2001).

Reverse logistics operations in general can be quite difficult to manage. There are some specific challenges for better supervision of reverse logistics operations for product returns. Not only does a retailer have to effectively manage the

actual product return, which is a challenge in itself, but, once returned, the product must be disposed of in some way. The most common disposal method for returned products is return to the manufacturer, but some returned products are repackaged and resold, resold as is, destroyed, or sold at other retail outlets (e.g., off price retailers or manufacturers' outlets) (Daugherty et al. 2001). To overcome these challenges, there need to have proper management and re-engineering process on reverse logistics in the supply chain. Thus, (Carter & Ellram 1998) have shown that resource reduction should be the final goal in the reverse logistics process. After the resource reduction effort has been made, the firm should try to maximize reuse, followed by recycling of returned products. Disposal should be the last choice adopted by the firm. Also in addition to environmental and cost benefits, a reverse logistics process can proactively minimize the threat of government regulations and can improve corporate image salient. The findings of the research by (Blumberg 1999) also suggest that reverse logistics services need to be incorporated with supply chain on a seamless basis. (Bernon & Cullen 2007) have identified that the key drivers for reverse logistics flows are, forecast accuracy and demand variability linked to purchasing policies, high on-shelf availability, liberal returns policies, legislative factors, new product introductions, logistics trade-offs, customer no-faults found and cash flow management practices. They have further discussed about the identification of these main drivers of reverse logistics processes and have highlighted the fact that most of the drivers are managerial in nature, and this opens the path to explore the ways of improving performance through redesigning/changing of these processes. Also, some studies conveys the ways of reengineering reverse supply chains and the supporting logistics activities, so that the effectiveness and profitability of a supply chain's product returns processes are enhanced. (Besides Bienstock, 2011) designed a project which is considered as an innovative approach to create a more convenient product return process and reduce the cycle time for customers to receive refunds and exchanges, when items are returned. In order to accomplish the reengineering effort, computer simulation models were developed and examined to compare the current process with a proposed new reverse logistics process under different operational scenarios, but, the number of studies carried on this area is significantly low. However, (Dennis & Kambil, 2001) highlighted the potential advantageous competitive positioning and market opportunities for firms whose supply chains handling important activities related to RL more effectively. Such strategies are vital for the firm's performance as they seek to differentiate themselves from their competitors, increase customer loyalty, and boost profit margins.
Hence, re-engineering reverse logistics processes are resource intensive in terms of implementation and maintenance where significant time and resources should be committed.

2. Methodology

This study is conceptualized to investigate the knowledge in the selected area through a systematic review of the previous literature. Initially articles were searched using relevant key words and it resulted fifty-three articles. In the next screening phase twenty-eight articles were extracted considering the article title and the abstract. The full text of each paper from the selected twenty-eight articles were reviewed in order to eliminate those articles that were not related to the topic. Inconsistencies were discussed by researchers and after a thorough screening, fourteen out of the twenty-eight articles were excluded from the study due to the issues with the scope. Hence total fourteen articles were considered for this study. Selection process of the study is shown in the Figure 1. The list of references listed on this paper contains all the articles studied. Although this study focuses only on fourteen articles, it is believed that the papers selected and reviewed contain reasonable characteristics and comprehensive body of the research work being accomplished in this area.

A comprehensive literature review was conducted with the purpose of identifying the applicability of business process re-engineering in reverse logistics process to improve supply chain performance. The review focused on refereed journal papers and publications within the period of 2000-2015, in order to improve the relevance of the study to the existing setting.

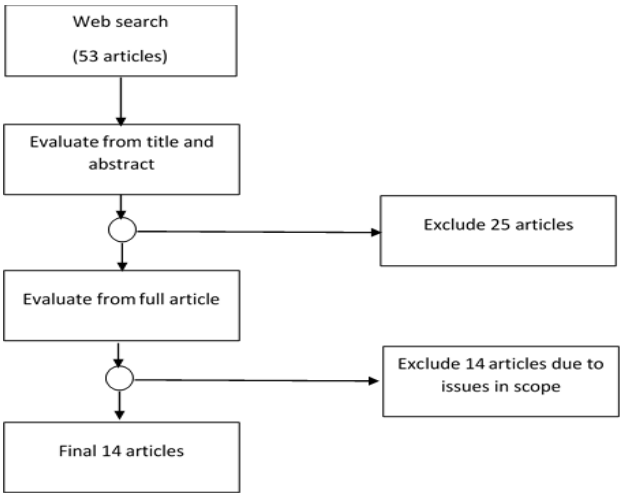

Figure 1. Literature screening process

3. Main results of the reviewed studies

Most of the researchers have concentrated on redesigning and reengineering the reverse logistics of supply chains by integrating modern digital technologies.

Due to the prevailing economic and environmental contexts, organizations have become aware of the importance of the reverse logistics and the significance of amalgamation of reverse logistics with the modern technologies. A study was conducted on integration of reverse logistics activities within a supply chain information system using a mobility aids distribution supply chain in Canada. (Chouinarda et al., 2005) have proposed two ''push–pull'' approaches which is a hybrid concept which is based on long term planning for certain stages of the operational processes (push) but which also allows the launching of other activities in reply to an order (pull) in order to better harmonize the supply (return of products) with the demand. This study emphasizes on the importance of amalgamation of reverse logistics with the regular supply chain to improve the efficiency and the effectiveness of the whole logistics network to overcome the pressure from the external environment. With this perspective, the researchers have developed a new organizational structure and information system architecture to reengineer the business processes to improve the management of the rehabilitation institute with the better integration of activities related to reverse logistics and their current activities. The proposed information system architecture will follow up the products through their life cycle, plan the activities, follow up the operational processes and follow up the efficiency of activities of the rehabilitation institute. Business process management systems have been commonly implemented by the companies during the past decade in order to design, improve and control critical business processes where people, processes and information become integrated through technology.

According to (Johanna et al., 2010) Business process management is a change management and system implementation methodology to aid the continuous comprehension and management of business processes that interact with people and systems both within and across organizations. This study presents the application of business process automation technologies on a reverse logistics process proposed for mobile phones reconversion and disposal with a Business Process Management System (BPMS). As stated by the results of the study, when the reverse logistics process of mobile phone reconversion and disposal is automated, it is possible to track each mobile phone from the reception point to the dismantling into parts and final reconversion, for a better visibility of the green process, all the process activities are generated automatically without human intervention following the workflow and the business rules defined, it is possible to track the lead time of the whole process and of each activity for real time monitoring and control and if there is any change on the process flow, the system is flexible enough to changing activities, roles and business rules without any software code development.

The results of a survey research on information sharing and collaboration practices in reverse logistics has revealed that the type of information technology (satellite, transport management system, Radio Frequency Identification –

RFID , enterprise resource planning systems , warehouse management system, bar code, internet, legacy, etc.) used do not have a differential impact on a company's performance in reverse logistics. However, information technology operational attributes positively affected reverse logistics performance and information sharing and collaboration are critical to reverse logistics performance. This study has identified information technology as a necessary component that provides the potential to improve the reverse logistics performance. Collaboration built on high quality information sharing has been identified as an essential factor for superior reverse logistics performance. (Olorunniwo & Li, 2010)

(Morgan et al. 2016) states that business organizations should develop a competency in reverse logistics and collaboration is needed for a reverse logistics competency to be achieved. Reverse logistics competency of a firm is magnified if that firm has a strong competency in information technology and if it can integrate information technology with the reverse logistics processes. Having a dual competency in IT and reverse logistics produces superior reverse logistics performance.

An effective return policy is used as a significant competitive strategy in the marketplace to influence the product sales substantially. Nevertheless, return policy is also considered as a problem for all parties in the supply chain due to the pain in processing returned commodities. Despite the fact that retailers are efficient in selling, they do not generally have the expertise in handling the reverse flow. The paper on "The role of 4PL as the reverse logistics integrator: Optimal pricing and return policies" propose the use of a fourth party logistics (4PL) as a return service provider. The researchers have proposed a model for the 4PL as an integrator of reverse logistics aspect of the supply chain. They have modeled the problem as a game and develop closed form solutions for the optimum strategies both for the seller and outsourcing the reserve logistics and for the 4PL. (Mukhopadhyay & Setaputra, 2006)

A study conducted by Marco A. Serrato, Sarah M. Ryan and Juan Gayta´ on "A Markov decision model to evaluate outsourcing in reverse logistics" presented a Markov decision model for evaluating the decision to outsource reverse logistics. It has considered several elements that are critical in defining the characteristics of a reverse logistics network, such as the uncertainty in the return volume, the length of the product life cycle, the sales behavior, the particular reverse logistics costs incurred, and the length of time defined for the existence of that reverse logistics system. Reverse logistics is not a firm's core activities and it is a very important to decide whether to outsource this function or not. The Markov decision model proposed through this study assists the firms in deciding whether to outsource or not and which is more profitable depending on the characteristics of the reverse flow. (Serrato et al., 2007).

(Jack et al., 2010) conducted a survey based research for conveying how the reverse logistics capabilities impact the relationship between antecedents (customer and firm related) and the cost savings achieved from reverse logistics strategies which significantly influence the performance of supply chain of firm. Moreover, this scrutiny examined the reverse logistics capabilities that can enable retailers to enhance their return policies and improve their overall cost position. However, it was found within the reserve logistics domain, the product returns process has emerged as a key element that can influence the customers' purchase decisions and thus, an effective product returns process is viewed as a competitive advantage of the firm.

By performing a systematic literature review of the related studies and by adopting a difference equation math approach and design of experiment which perform a robust what-if analysis of a closed loop supply chain under a variety of operational and market conditions, (Cannella et al., 2016) analyzed the inventory and order flow dynamics in closed-loop supply chains (CLSCs). This analysis assists in managerial decisions on designing and managing CLSC's reverse logistics in order to improve performance which should be contingent to a number of different factors (e.g. number of echelons of the supply chain, customer demand patterns, etc.).

(Škapa & Klapalová, 2012) led an exploratory research for investigating whether Czech management sees reverse logistics (RL) activities as a source of value, and how RL performance is measured in Czech companies. A part of this research takes the form of longitudinal research whereas the presented results are part of broader explorative research focusing on diverse aspects of RL in the Czech Republic. The findings revealed that reverse logistics have a positive influence on firms' profits and there is a positive relationship between the profitability of RL activities and a company's strategic focus on RL.

(Turrisi et al,. 2013) presented a model describing a closed loop supply chain (CLSC) using different equation math approach on the foundation of the impact of reverse logistics on supply chain performance. They proposed R-APIOBPCS, a new order policy which explicitly considers the reverse flow of products. Through design of experiment (DOE) approach, the researchers have identified the factors that influence the performance of the supply chain and offers important implications for practice for logistics and supply chain managers to increase the effectiveness of supply chain performance.

A survey based research was carried by (Huang & Yang, 2014) to scrutinize the relationship between RL innovation and environmental and economic performance while incorporating institutional theory to verify how institutional pressures moderate these relationships. The research provided ample evidence concerning the relationships among resource commitment, RL capabilities and performance in conclusive results. The study indicated that RL innovation can be viewed as one of the settings of performance and RL was found to be positively correlated to both environmental and economic performance where effective RL can reduce costs, increase profitability, improve customer satisfaction, customer value and enhance environmental performance.

(Morgan et al., 2018) proposed a structure-conduct-performance frame work, linking resource commitment to sustainable supply chain management, reverse logistics, and operational performance. A sustainable reverse logistics capability was investigated to mediate the performance benefits associated with resource commitments to sustainable supply chain management. Thus, the study comprehensively examined the relationship between organizational structure, operational performance and sustainable reverse logistics.

All the articles taken into consideration in the analysis are briefed in the summary table; Table-1.

Table 1. Findings of reviewed studies - Objectives and Methodology used

Title	Year	Objective/s	Design Method/s	Key Findings
Reverse logistics capabilities: antecedents and cost savings	2010	To determine how reverse logistics capabilities impact the relationship between customer and firm related antecedents and the cost savings achieved from reverse logistics strategies.	Survey	• Resource commitments and contractual obligations influence reverse logistics capabilities which results in cost savings. • Customer opportunism is found to be negatively related to reverse logistics capabilities.
Closed-loop supply chains: What reverse logistics (RL) factors influence performance?	2016	To study Closed Loop Supply Chains' (CLSC) dynamics and the effect of RL factors on the supply chain performance	Systematic review of literature(SRL) and mathematical design of experiment (DOE) approach	• Companies have to invest in Reverse Logistics (RL), not only to accept the advocated challenge of sustainable operations, but also because RL with product returns flow will improve the Supply Chain (SC) dynamic performance.
Impact of reverse logistics on supply chain performance	2012	To analyze the impact of reverse logistics on order and inventory variance amplification in a single-echelon supply chain (SC).	SRL and DOE approach	• The variability of RL in a closed loop SC increases the serviceable inventory variance and implied the proper design of the reverse flow improves the global performance. • New order policy, R-APIOBPCS
Reverse logistics in Czech	2012	To explore how value is being generated by reverse logistics (RL),	Survey	• RL positive influence on firms' profits.

companies: increasing interest in performance measurement		and whether (and how) they track its costs and benefits regarding performance.		• Positive relationship between the profitability of RL activities and a company's strategic focus
Reverse logistics innovation, institutional pressures and performance	2014	To examine the relationship between RL innovation and environmental and economic performance	Questionnaire based survey	• RL innovation is positively associated with environmental and economic performance. • Institutional pressures positively moderated the relationships between RL innovation and environmental performance.
Resource commitment and sustainability: a reverse logistics performance process model	2018	To motivate future sustainable supply chain management (SCM) and reverse logistics research	Survey methods and structural equation modeling	• Developed a framework linking resource commitment to sustainable SCM, reverse logistics and operational performance. • Model suggests that resource commitments may be used to develop a sustainable reverse logistics capability, reducing the environmental impact of reverse logistics activities
Using activity-based costing to reengineer the reverse logistics channel	2000	To illustrates an actual application of Activity-based costing (ABC) to reverse logistics activities performed across supply chain organizations.	Case Study	• The cost savings derived from a co-operative effort among supply chain firms. • True cost of logistics operations using activity-based costing.
A Process Re-engineering Framework for Reverse Logistics based on a Case Study	2010	To propose step wise framework to perform process re-engineering in order to enhance reverse logistics performance.	Case Study	• Discloses process reengineering case in reverse logistics, and outlines the associated framework which can be used for designing such reverse logistics systems.
Integration of reverse logistics activities within a supply chain information system(SCIS)	2005	To deal problems on the integration of reverse logistics activities within an organization and to the coordination of SCIS system	Case study	• New approaches in information support system on supply chain.
Reverse Logistics Process Automation with BPMS	2010	To present the application of business process automation technologies on a reverse logistics process with a Business Process Management System.	Case study	• A simulation of the business process while the control process indicators are analysed. • The contribution of Business Process Management (BPM) for companies' sustainability
Information sharing and collaboration	2010	To investigate how the use of information technology and supply chain	A survey based on a previous exploratory research and	• Results stated that the type of information technology used per se did not have a differential impact on a company's performance in reverse logistics.

practices in reverse logistics		management initiatives (information sharing and collaboration) impact a company's performance in reverse logistics	Literature review	• Information technology operational attributes positively affected reverse logistics performance and information sharing and collaboration are critical to reverse logistics performance.
Developing a reverse logistics competency: The influence of collaboration and information technology	2016	To explore the influence of collaboration and information technology (IT) on the reverse logistics competency of firms	Survey	• Positive influence of an IT competency on the relationship between collaboration and a reverse logistics competency
The role of 4PL as the reverse logistics integrator: Optimal pricing and return policies	2006	To propose the use of a fourth party logistics (4PL) as a return service provider and develops optimal decision policies.	Development of a model	• Optimal values for the seller's and the 4PL's decisions are presented. • Conditions under which profits for the seller and 4PL both increase
A Markov decision model to evaluate outsourcing in reverse logistics.(RL)	2007	To explore the hypothesis that outsourcing reverse logistics functions is more suitable when returns are more variable	Development of a model	• A Markov decision model on RL • Return fraction increases the outsourcing threshold is more likely to be crossed

4. Discussion

The classification of factors studied in the selected articles is discussed in this section. (Refer Table 2)

Table 2. Methods of reengineering reverse logistics

Study	Methods of reengineering reverse logistics		
	Collaborative relationships	Information Technology integration	Outsourcing
(Chouinarda, D'Amoursa, & Aı¨t-Kadia, 2005)		*	
(Johanna, Santiago, Carlos, & Carlos, 2010)		*	
(Morgan, Richey, & Autry, 2016)	*	*	
(Mukhopadhyay & Setaputra, 2006)			*
(Olorunniwo & Li, 2010)	*	*	
(Serrato, Ryan, & Gaytán, 2007)			*

Under this category papers are classified according to the method of reengineering that they are focused on. According to the reviewed articles, reengineering reverse logistics through information technology integration has gained much concern from the researchers. Four of the studies which are under consideration are ascertained on reengineering reverse logistics process through information technology integration.

As stated by the reviewed studies, most commonly conversed information technology based technologies in reverse logistics are internet, enterprise resource planning systems, bar codes, legacy systems and electronic data interchange. In addition to those technologies, there are satellite, radio frequency data communication and transportation management as well (Olorunniwo & Li, 2010).

Information is a strategic factor for reverse logistics in order to gain control on the conditions of post-consumer waste, materials incorporated into the residue, type of processes required to re-take it and inventory volume of available materials to be collected (Johanna et al. 2010). Thus, the reviewed articles commonly identified that importance of information technology is emerged and integrated with reverse logistics in order to fulfill the non-availability of accurate and sufficient information regarding the reverse flows, and to make the process more easy to handle and more efficient. Consequently, most of the firms tend to integrate information technology in reengineering their business processes regarding reverse logistics. These studies discuss about the way of improving the performance and harmonizing the reverse flow of goods through information technology.

Reviewed articles have identified outsourcing as a strategic decision for the improvement of firms' reverse logistics. Reengineering and redesigning the reverse flow through outsourcing the process to the third party or fourth party logistics providers is considered in these articles. According to the reviewed literature, while retailers are efficient in selling and producers are efficient in designing and producing the product, they do not usually have the expertise in handling the reverse flow and it is not their core competency. Thus, organizations tend to outsource their reverse logistics to external logistics providers who have the expertise knowledge, experience and competency in order to improve the efficiency and effectiveness of the process. Also, uncertainty in the amount of units returned each period affects the decision of whether or not to outsource firms' reverse logistics management (Serrato et al. 2007).

The studies which have discussed the effect of reengineering the reverse logistics on supply chain performance parameters are shown in the table 3.

Table 3. Impact of reengineering reverse logistics on supply chain performance

Study	Impact on Supply chain performance			
	Improved customer satisfaction	Environmental sustainability	Cost reduction and efficient handling of resources	Improved reverse supply chain visibility
(Chouinarda et al. 2005)	*		*	*
(Johanna et al. 2010)		*		*
(Morgan et al. 2016)			*	
(Mukhopadhyay & Setaputra, 2006)			*	
(Olorunniwo & Li, 2010)	*		*	*
(Serrato et al. 2007)			*	
(Jack et al. 2010)			*	
(Cannella et al. 2016)		*	*	*

(Turrisi et al. 2013)		*		
(Huang & Yang 2014)	*	*	*	
(Morgan et al. 2018)		*		

Reviewed articles were focused mainly on the cost benefit, environmental sustainability, customer satisfaction and the visibility of the reverse supply chain achieved through reengineering the reverse logistics processes of an organization.

Sustainability is becoming a strategic priority for many companies and managing reverse logistics has become an attention focused field of businesses. Thus, reengineering the reverse flow of goods is a way to achieve the sustainable goals of businesses in an efficient and productive manner (Johanna, Santiago, Carlos, & Carlos, 2010). As stated by the studies managing reverse flow is essential in order to comply with the environmental and government policies and regulations. (Trrisi et al., 2013) provided evidence that adopting a closed loop structure with reverse logistics can be economically profitable. In fact, collection of end-of-life products leads to avoid the variance amplification of orders to supplier.

A closer follow-up of the operational processes and products through their life cycle, tracking and handling the returns has a positive impact on the service quality related performance of the firms (Morgan, Richey, & Autry, 2016). Reverse logistics is concerned with providing superior after service to the customers and hence, managing the reverse logistics in an efficient manner leads to higher customer satisfaction and retention. To benefit from the complementary nature of material and information flows of the supply chain and reverse logistics, a total network vision should be used to improve the coordination and collaboration among the various actors (Chouinarda et al. 2005). Therefore, reverse logistics should be redesigned in a way to improve the supply chain visibility.

According to the findings on (Jack et al., 2010), the retailers can enhance their return policies and improve their overall cost position through optimized reverse logistics operation. Reverse logistics enables the firms to reuse the products in good condition and to recycle some returns. For an example, recycling the containers of the products will save the cost of manufacturing containers and buying raw materials for the manufacturing process of those containers. This may lead to cost saving and firms can earn a profit through scrap sales as well.

5. Frameworks and models

Models and frameworks presented in the selected articles are further discussed in this section. (Refer the Table 4).

Table 4. Models/Frameworks

Study	Framework/ Model	Uses/ Advantages
(Chan, 2010)	Step by step approach to reengineer the reverse logistics process	• Better outcomes from collaborative decision making • Ability to adopt sustainable methods • Opportunity to explore new technologies
(Goldsby and Closs, 2000)	ABC to re-engineer the reverse logistics process	• Cost reduction • Beneficial to both distributor and retailor • Environmentally friendly logistic system

(Mukhopadhyay & Setaputra, 2006)	Profit-maximization model	• To jointly obtain optimal policies for the seller and the fourth party logistics provider.
(Serrato et al. 2007)	Markov Decision Model	• To evaluate the decision to outsource

A step by step approach was proposed by (Chan, 2010) for reengineering the reverse logistic process. This approach consists of six steps as defining the objectives of the reengineering project, identifying the potential improvement areas, understanding the whole logistics process and view it from a process point of view, developing manageable solutions for the potential improvement, evaluating the alternatives from the whole process point of view and finalize the decision, and implementing the new design. At the end of each step, a set of questions will be given. Its idea is to help people realize the critical issues in each step and ensure that the requirements are fulfilled before they move on. According to (Chan, 2010) both suppliers and customers can use this model and can incorporate business process reengineering into their reverse logistics process to achieve greater performance and higher customer satisfaction. This collaborative approach can be used to implement more effective and sustainable designs and methods. Also, critical analysis of the process can lead to find the hidden opportunities for potential cost savings.

(Goldsby and Closs, 2000) proposed a model based on Activity based Costing (ABC). ABC is a tool used by managers to estimate the ``true costs" of operations more carefully. This approach illustrates an actual application of ABC to reverse logistics activities performed across supply chain organizations. Here, the approach is explained using a case study of a beverage distributor and retailer that collect empty beverage containers for recycling purposes. The case study demonstrates the ABC application in detail and discusses the reengineering of supply chain-wide processes resulting from the analysis. (Goldsby & Closs, 2000)

(Mukhopadhyay & Setaputra, 2006) proposed a model for the 4PL as an integrator of reverse logistics. The researchers have model the problem as a game and develop closed form solutions for the optimum strategies both for the seller and outsourcing the reserve logistics and for the 4PL. The optimum results obtained from the model are stated in the paper in terms of the market parameters. This study also derived a number of insights into how a manager can influence these parameters using marketing and operational strategy variables to obtain the desired optimum values for the decision variables and get the benefit of a ripple effect to increase their profits.

(Serrato et al. 2007) presents a Markov decision model to explore the hypothesis that outsourcing reverse logistics functions is more suitable when returns are more variable. It considered several elements that are critical in defining the characteristics of an reverse logistics network, such as the uncertainty in the return volume, the length of the product life cycle, the sales behavior, the particular reverse logistics costs incurred, and the length of time defined for the existence of that reverse logistics system.

6. Conclusion

Recently growing research interest towards the importance of reverse logistics have made an enormous contribution on this subject. Based on the review and the analysis of the articles, some broad suggestions for future research can be derived. Despite of the significant development achieved on this research area over the past decade, there remain many important issues for future investigation.

Reverse logistics could be a value adding operation if it is properly managed. It has a significant effect on the supply chain performance. According to the reviewed studies, reverse logistics operation can be reengineered by outsourcing, building collaborative relationships with the supply chain partners and through information technology integration.
Outsourcing the reverse logistics function to firms those who have the expertise knowledge to handle these operations will result a properly managed reverse logistics operation. Effective information sharing and resource sharing plays a prominent role in reverse logistics and collaborative relationships and partnerships with the supply chain partners as well as the other industry actors will pave the way for a well-organized operation. Information technology enabled reverse logistics will be very efficient, easy to manage and will provide real time information to the organizations.
Highly optimized efficient and effective reverse logistics will improve the supply chain visibility of the firm. At the same time, having an organized process to manage the market returns will improve the customer satisfaction and the

loyalty. This will also help for the customer retention. An optimized reverse logistics operation ensures the proper disposal of waste matter and this will help the firm to build an image as an environmental friendly sustainable organization. This will aid in branding and will help to gain a competitive advantage over other rivalries. Firms can also resale and recycle the returned products and can earn a profit through scrap sales. Adding the products with damaged packaging and the returned unsold products will reduce the cost of producing new products and this will leads to efficient resource handling. Thus, supply chain performance of an organization can be significantly improved by optimizing the reverse logistics through reengineering.

The conceptual framework shown in the Figure 2 illustrates the findings of the study.

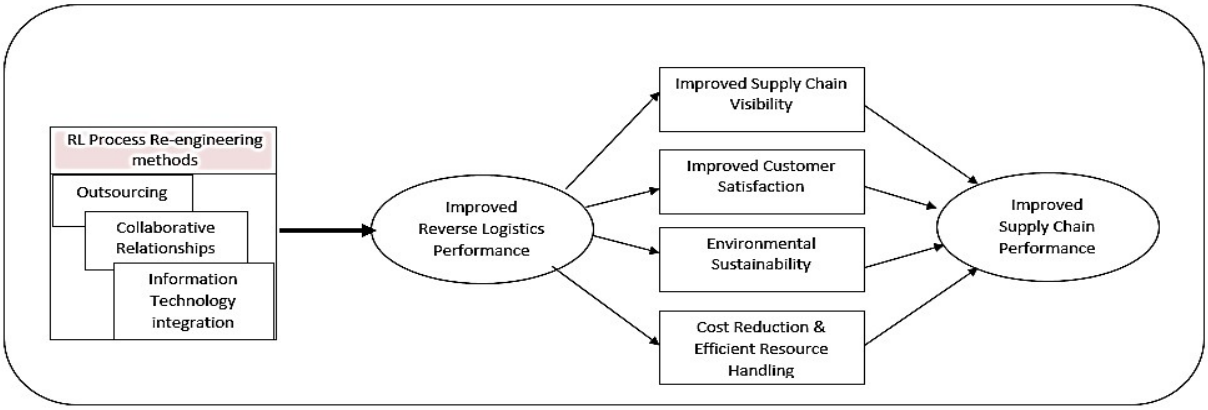

Figure 2. Conceptual Framework developed based on findings

Most of the reviewed studies were concentrated on transportation function. Very few of the researchers have focused their attention on other logistics operations like warehousing, in reverse logistics. Only few studies were conducted to identify the relationship between business process re-engineering and reverse logistics. Therefore, it is essential to conduct more studies on this area due to the fact that the reverse logistic is a key area which can achieve higher supply chain performance through re-engineering. Most of the companies are transforming to visionary organizations in order to face the high competitiveness in the market and to sustain in the industry, and such organizations which are having a clear vision of the future should conjoin optimized reverse logistics operation to their business functions. So, they are targeting on innovative ways to reduce cost and improve services through reverse logistics, and hence, it would be necessary to conduct research on finding new ways to optimize reverse logistics through re-engineering the existing processes. Researchers should focus their attention to identify new trends in the reverse logistics and innovative ways to improve the supply chain performance through re-engineering reverse logistics.

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