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Reverse Logistics and Manufacturing Performance: A Conceptual Review

***Umar Abdullahi Maiauduga; *Prof. Muktar Abdullahi; *Prof. Tijjani Abubakar; & **Sunusi Abdulkarim**

*Department of Management & Information Technology, Faculty of Management Sciences, Abubakar Tafawa Balewa University Bauchi, PMB 0248 Bauchi State, Nigeria. **Department of Transport and Logistics Management, Nigeria Army University Biu, Biu Borno State Nigeria.

Corresponding Author: umaiauduga@gmail.com

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Abstract

Reverse Logistics (RL) is a process of collecting, inspecting, and dispositioning returned products or materials (recycling) in the manufacturing sector. The main aim of this paper is to review extant literature in the field of sustainable manufacturing practices (SMPs), particularly, reverse logistics and its relation to manufacturing performance, from the dimensions of environmental, operational and financial performance. It was identified that, manufacturing sector is the focal point for the implementation of reverse logistics concept. Thus, this paper focuses on conceptual aspect of reverse logistics ranging from dimensions, types and benefits. The review was underpinned by Ecological Modernization Theory (EMT). Furthermore, the paper reviewed previous empirical studies concerning the effects of reverse logistics on manufacturing performance, and most of the previous findings were found positive and significant. Therefore, this paper concluded the following propositions; Reverse logistics has positive and significant effect on the manufacturing performance, specifically on environmental, operational and financial performance. Hence, it is recommended that, the adoption of reverse logistics practices by manufacturing industries shall be encouraged. Lastly, future researchers should carryout empirical study on the topic under review to test the propositions of this study empirically.

Keywords: Reverse Logistics (RL), Manufacturing Performance, Environmental Performance, Operational Performance, Financial Performance, Ecological Modernization Theory (EMT).

Introduction

Reverse logistics (RL) constitutes a number of activities that reclaim product value and terminate the product life-cycle after consumption. RL includes taking back the used product from end user and sending it back to manufacturer for recycling. The practice of customers returning products to the original manufacturer in an effort to salvage and possibly even recoup value from any unsold parts or products is known as reverse logistics (Das et. al., 2021). According to Murphy (2012) RL is the process of organizing, putting into practice, and managing the economical and efficient flow of finished goods, in-process inventory, raw materials, and associated data from the point of consumption back to the point of origin with the goal of generating value again or disposing of it properly. A series of "reverse logistics" processes are employed to recover value and complete the life cycle of an item after it is sold. Receiving the product from the customer and returning it to the manufacturer for recycling or further production is known as reverse logistics. Remanufacturing, reuse, and recycling are all combined to form recovery (Das et. al., 2021).

According to Sundram et. al., (2017) it is also defined as the process of customers returning defective items to suppliers or any other business serving as an agent to reverse logistics. By streamlining the manufacturing and shipping processes, returning products to suppliers at the end of their useful life so they can restore, replenish, rehabilitate, restitute, revamp, repackage, or correct the material can reduce resource costs (Sari, 2017). RL "closes the loop" of a typical forward supply chain and includes reuse, remanufacturing, and/or recycling of materials into new materials or other products with value in the marketplace. The idea is to eliminate or minimize waste such as energy, emissions, chemical or hazardous and solid wastes (Ashby et al., 2012). When suppliers are encouraged to take back packaging materials it is a form of reverse logistics that is capable of greening the supply chain and this reduces the amount of packaging materials that enters into the waste system (Anne et. al., 2015).

In view of the foregoing, the following propositions are hereby proposed: -

P1: Reverse logistics has positive and significant effect on the environmental performance of manufacturing companies.

P2: Reverse logistics has positive and significant effect on the operational performance of manufacturing companies.

P3: Reverse logistics has positive and significant effect on the financial performance of manufacturing companies.

Manufacturing Performance Measurements

Manufacturing performance, according to Ketokivi and Schroeder (2004) is a vital component of a firm's manufacturing

strategy. Meanwhile, manufacturing strategy is critical in determining manufacturing performance priorities (Karim, Smith, & Halgamuge, 2008a). While having a higher and improved degree of manufacturing performance provides a firm with a competitive edge, to remain competitive, it is imperative that a manufacturing assess and determine its performance condition. According to the available literature on manufacturing performance in an organizational context, the evolution of manufacturing performance measurement has evolved from closed to open systems and has been continuously enhanced over time (Gomes Yasin, & Lisboa, 2004).

Studies on manufacturing performance throughout the past century have concentrated on the relationships between various factors such projects, organizational structures and procedures, machinery, and people. Since then, the focus has shifted from being solely on financial metrics (profit, return on investment), to rather concentrating on multifaceted strategic criteria including delivery, flexibility, quality, and punctuality (Ghalayini & Noble, 1996). Even while financial measurements are generally listed first and are the most commonly utilized in organizational study, some researchers have addressed the non-financial side. A few studies have also stressed both viewpoints (financial and non-financial), resulting in a debate about how the perspective measurements will be focused. According to previous academics, the first perspective is based on financial measurements, which are highly valued for their ability to consistently gauge a company's performance. It has been covered in great detail to track the company's progress. But inside the industrial sector, it was shown that financial metrics have no direct bearing on production strategies (Maskell, 1991).

Ghalayini, Noble and Crowe (1997) contend that the new management techniques that grant floor workers autonomy and authority are unaffected by financial assessments. Buichi (1994) asserts that financial analyses undervalue quality worth and disregard overproduction. The approach taken to calculate performance for many decennials was found to be incompatible with the current manufacturing standard, which places a greater emphasis on customer preferences and other operational performance variables, despite the best efforts of accounting specialists. Numerous books authored by accounting and manufacturing experts suggest that non-finance assessments be used in today's manufacturing businesses (Mathur, Dangayach, Mittal, & Sharma, 2011). As further evidence, a study by Kathuria and Porth (2003) highlighted the challenges in assessing the financial objectives of performance measures, especially from private firms. Obtaining financial information is difficult since businesses are hesitant to declare and publish their financial data because the information is considerably more sensitive than non-financial measures. There is a compelling argument that financial indicators, being intrinsically cost-centered rather than profit-centered, have little bearing on setting factory performance objectives (Youndt, Snell, Jr Dean, & Lepak, 1996). Additionally, according to Chen (2008), Hallgren (2007), and Kathuria & Porth (2003), traditional cost-accounting-based financial performance measures are not specific to the operational scope of manufacturing and cannot explain significant performance issues in today's manufacturing

environment. Furthermore, they are dependent on factors outside the control of the manufacturing unit.

To summarize, Uyar (2009) listed the following drawbacks of financial performance measures (otherwise called traditional performance measures) : they are overly retrospective; they can't predict future performance; they only provide a small amount of information on the underlying causes or solutions to issues; they don't capture significant business changes; they are too aggregated and summarized to direct managerial action; and they only reflect functions within a company, not cross-functional processes. Last but not least, the use of non-financial performance in the analysis of contemporary manufacturing aligns with the multidimensional argument of Mathur et al. (2011) as opposed to traditional performance from a single company accounting perspective, especially financial performance. It is stressed that relying on the presumption that, in the future manufacturing environment, the consistent qualities and specifications of a standard product in the previous cost accounting system are no longer applicable (Kaplan, 1983).

The little idea of financial performance requirements will be replaced by the growth of non-financial performance (Thrulogachantar & Zailani, 2011). In addition, improving non-financial metrics like quality, inventories, productivity, adaptability, and creativity are required to meet the difficulties of creating an internal accounting system that would support the organization's new manufacturing strategy (Kaplan, 1983). Furthermore, non-financial metrics add substantial value to the organization by guiding and motivating the advancement of the human component (Santori & Anderson, 1987). Non-financial performance metrics are thus applied to the human resource management component as well as the manufacturing strategy and procedures. Non-financial performance is just as hidden as the financial perspective when it comes to business confidentiality. Due to the possibility of revealing information about the firm's efficacy and competitiveness, non-financial data is restricted and safeguarded for internal management solely (Klassen & Whybark, 1999). For example, in a study of information flows between executives and financial analysts in a manufacturing company, (Gomes et al., 2007a) revealed that executive perception of non-financial performance disclosure will be detrimental to the company's competitive position.

However, some researchers (Flynn, Sakakibara, & Schroeder, 1995; Klassen & Whybark, 1999; Swamidass & Newell, 1987; Youndt et al., 1996) have successfully gathered feedback from respondents by using self-reported perceptual measures of non-financial performance relative to competitors. This makes it much simpler to collect data on production views using non-traditional assessments as opposed to financial ones. Last but not least, Choe (2004) may have had a different viewpoint than the other two when it came to the third perspective, which holds that firm strategic advantages should be evaluated from both angles since financial performance by itself merely shows the results of prior efforts and does not always translate into improved performance in the future.

Financial and non-financial performance measurements must be incorporated into strategies, operations, and measures in order to continuously work toward a firm's strategic advantages

(Tuanmat & Smith, 2011). Realizing that a manufacturing company's goal is to produce goods and deliver them to customers, but that it also has to pay attention to important factors of production performance like cost, quality, flexibility, and delivery (Skinner, 1969). Gomes et al. (2004) gave two criteria that were employed in the selection of the measures used in this investigation.

First, take into account the sector's contextual and environmental features. Because this study is conducted in the manufacturing industry setting, which contextually and ecologically incorporates the operation of a production floor by its business character, the selection of non-financial aspects is in accordance with the manufacturing business objectives. This leads to the second framework of the measure selection, which are organizational goals. Manufacturing companies are having difficulty developing strong plans. The metrics used in this study were chosen based on two criteria provided by Gomes et al. (2004).

First, consider the environmental and contextual characteristics of the sector. Because this study will be conducted in the manufacturing industry setting, which contextually and ecologically incorporates the operation of a production floor by its business character, the selection of non-financial aspects is in accordance with the manufacturing business objectives. This leads to the second framework of the measure selection, which are organizational goals. Manufacturing companies are having difficulty developing strong plans. To acquire a competitive edge, a firm's competitive strategy, structure, environment, and production strategy must be reconciled (Ward, Bickford, & Leong, 1996). As a result, the selection of non-financial performance metrics will provide the organization with a strategic long-term competitive weapon.

Environmental Performance

Environmental performance includes and focuses on reducing air emissions, waste water, and solid wastes, as well as reducing consumption of hazardous/harmful/toxic materials, reducing the frequency of environmental accidents, and improving an enterprise's environmental situation (Úbeda-García, et. al., 2021). In general, environmental performance refers to lowering waste, pollution, and emissions while conserving resources or energy. Environmental performance in the manufacturing sector included minimizing air and water emissions, waste, and hazardous chemicals (Li, et. al., 2020). Measurement of supply chain environmental performance can include a company's ability to reduce air emissions, waste water, solid wastes, hazardous material consumption, and the frequency of environmental accidents (Maaz, et. al., 2022). Thus, GSCM procedures are implemented with the goal of enhancing environmental performance. Effective management of suppliers can encourage recycling, reuse, and re-manufacturing activities, which would help to improve their environmental performance.

Operational Performance

Operational performance; any company must be successful in order to function. This achievement was evident in the increased number of goods delivered on time, lower inventory levels, lower scrap rate, larger product line, and enhanced capacity utilization (Min & Gale,

1997). Throughout the literature, operational performances throughout the supply chain have been found. Product quality, process performance, delivery, and flexibility will all benefit from GSCM activities (Chauhan and Singh, 2018; Inman and Green, 2018). Previous research indicates that internal GSCM techniques improve operational performance by reducing waste, increasing product delivery capacity, and improving capacity utilization and production efficiency (Famiyeh et al., 2018). Also, external cooperation with suppliers or customers in GSCM practices would promote the improvement of operational performance.

Financial Performance

Financial performance includes and focuses on positive economic performance, such as lower material purchasing costs, lower energy consumption costs, lower waste treatment fees, and lower waste discharge fees, while also attempting to eliminate negative economic performance, such as higher investment costs, higher operational costs, higher training costs, and higher costs of purchasing environmentally friendly materials.

Financial performance is the company's financial condition over a certain period that includes the collection and use of funds measured by several indicators of capital adequacy ratio, liquidity, leverage, solvency, and profitability. Financial performance is the company's ability to manage and control its resources. Business activities are generally divided into three; (a) manufacturing, (b) trading, (c). Manufacturers talk about the cost of production, raw materials, cost of goods sold and profit margins (Fatihudin, 2018). Speak trade in purchases of goods/services, distribution channels, and retail. And Services talk service fees, speed, convenience, security and service benefits. All business activities must be profitable. Financial performance is a measure of how much a company's ability to create profit, profit or revenue. How to measure the company's financial performance in creating profits, especially companies in the financial industry such as Banking. This can be viewed from the financial statements. The financial statements consist of; (a) Balance Sheet, (b) Income, (c) Cash flow, (d) Changes in capital. These financial statements are usually prepared and reported in annual, semester or trimester periods. It depends on his needs. Sometimes financial statements can be made different versions depending on their interests. There are financial reports for directors/commissioners. There are financial reports for tax payments. There are financial statements for the general meeting of shareholders. There are financial statements to obtain credit loans Banking. Healthy-not a company's finances can be analysed from the four things above (Fatihudin, 2018).

Reverse Logistics and Performance of Manufacturing Companies

Reverse logistics is the process of retrieving the product from the end consumer for the purposes of capturing value or proper disposal. Activities include collection, combined inspection/selection/ sorting, re-processing/direct recovery, redistribution, and disposal. Management of wastes in the outbound function such as reverse logistics and waste exchange can lead to cost savings and enhanced competitiveness. Increased globalization has greatly

increased competition and this has brought about growing demand flexibility and cost-efficient systems by companies. Through the management of wastes in reverse logistics and waste exchange, companies can enhance their competitiveness as their environmental efficiency is enhanced (Ashby et. al., 2012). Reverse logistics activities differ from those of traditional logistics. Reverse logistics networks have some generic characteristics related to the coordination requirement of two markets, supply uncertainty, returns, disposition decisions, postponement and speculation (Amemba et al., 2013). Reverse logistics practices vary from one industry to another. Industries where returns form a larger portion of operational cost tend to have better reverse logistics systems and processes in place (Hawks, 2006).

Manufacturing companies worldwide have demonstrated a strong desire to preserve and safeguard their operating environment in recent years. As a result, businesses are not only interested in the traditional downward supply chain flow of goods from the manufacturer to the customer, but they are also thinking ahead or responding to environmental initiatives that guarantee the upward supply chain flow of used goods from the final consumer back to the manufacturer (Mathiyazhagan & Haq, 2013). As a result, reverse logistics (RL) has progressively emerged as a distinctive skill in modern supply chains and appears to have attained economic significance. Without a doubt, because of the increasing demands from many stakeholders and its projected benefits to supply chain performance, RL is receiving particular attention in the field of industrial practitioners. For example, Govindan et. al., (2015) suggest that consumers have grown increasingly aware of environmental issues over time, placing pressure on businesses to implement RL. According to Vanalle et. al., (2017) and Zhu, (2013) among other researchers, companies who incorporate RL into their supply chain do so in reaction to government requirements pertaining to the environment, competitive pressures, and managers' desire to do so.

Additionally, businesses are under tremendous pressure to include RL into their "strategic thinking" and operations since the communities in which they operate demand them to adopt environmentally sound practices (Abdullah et. al., 2017). According to Mandota (2015) RL improves a company's financial situation, competitiveness, inventory management, and environmental results in addition to supply chain performance. Zhang et., al., (2019) claim that manufacturing companies can reduce waste and eradicate it by implementing RL, which lowers the cost of the supply chain from beginning to finish.

Reverse Logistics Dimensions

Over the past few decades, reverse logistics has become a prominent area of research interest in the supply chain management literature. Though it is widely used by logisticians and industry practitioners, the idea is still relatively new. Its definition has been inconsistent as a result. The majority of definitions have been developed with an emphasis on either the economic or environmental standpoint of RL, or both. As an illustration, Dowlatshahi (2011) defines RL as the management procedure of retrieving goods (such as waste products) from the client, either to guarantee the appropriate handling of the returned goods or to capture value

(earning financial gains). Moreover, Stock (1992) defined RL as any logistics activity (recycling, material reuse, etc.) connected to the handling of hazardous waste materials. This explanation explains why RL is frequently described as an environmentally friendly technique. Table 1 presented detailed explanation of various dimensions of RL.

Table 1: Reverse Logistics Dimensions

Reverse Logistics	Explanations
Remanufacturing	Involves gathering used goods, assessing their condition, and swapping out outdated components with new or refurbished ones. In this case, the previous product's identity, worth, and functionality are preserved.
Reuse	Involves the unprocessed reintroduction of used or barely used products into the supply chain. In this case, the product's value is diminished because further processing is not required.
Recycling	Involves gathering discarded goods, deconstructing them if necessary, classifying them, and processing them again to create new forms. Here, the previous product's identity, worth, and functionality are gone.

Source: (Wells & Seitz, 2005; Wainaina 2014).

Types of Reverse Logistics

The followings are types of reverse logistics identified by (Grabara 2014):

1. Receiving Returns: There may be multiple ways for the company selling the product to accept returns. Returns for purchases made at physical stores typically take place there as well. The same delivery method is used to send returns for online retail or sales
2. Handling Returns: Every item must be received, logged, and inspected to guarantee that returns are handled correctly. It will verify whether any issues have arisen during transportation or storage, enabling the start of the necessary procedures.
3. Resale of Return: What does the company do with the products after they are received? Assume they are successfully returned to the source. The original consumer is then given the option of a refund or a replacement product, and they are made available for resale to other customers.
4. Refurbishing Return: In the event that a product is damaged, it will first have minor repairs before being put back up for sale. Then, the company can resell them as discounted or refurbished goods. Consider the Indian furniture company Urban Ladder, which offers discounted pre-owned, occasionally slightly damaged things on another website as an example of reverse logistics in action.
5. Salvaging Return: Salvaging is the practice of either restoring items to a workable state or fixing those that cannot be marketed as new, after which they are sold as used goods.

6. Return recycling: Broken or worn-out products could still be valuable. Even if they might not be suitable for usage, they could be sold as scrap or broken down into bits and utilized in another way.
7. Recall Return: When issues emerge, the significance of reverse logistics is evident. A company may occasionally request that customers return a product due to safety concerns or technical problems; this is frequently referred to as a recall. In this case, they could check the products for problems and resolve them, issue a warning, or give reimbursements for the damaged items.

Benefits of Reverse Logistics

It is evident why reverse logistics is necessary and advantageous. Businesses will suffer if these processes are not optimized (Grabara 2014). The following are the main justifications for why reverse logistics are important for every organization:

1. It enhances client satisfaction and promotes recurring business. It is expected that returns and repairs would be handled seamlessly.
2. It lowers waste, which improves the bottom line.
3. By recycling, reusing, and reselling, it lessens the organization's environmental impact.
4. Product recalls safeguard consumers' health and safety, which enhances the company's standing.
5. It completes the circle around potentially dangerous products entering the environment.

Ecological Modernization Theory (EMT)

Ecological modernization theory (EMT) is the underpinning theory of this study. Mol and Jänicke (2020) reported that, EMT was originally proposed by Martin Janicke and Joseph Huber in (1970). EMT suggests that it is possible to promote economic growth by giving higher priority to the environment. It is no longer necessary to trade off economic growth for environmental quality (Hajirasouli & Kumarasuriyar, 2016). The theory states that, government and industry must recognize, develop, approve and adopt technological innovations to tackle ecological issues without causing harm to the environment (Bergendahl et. al., 2018). The theory further states that, organizations should imbibe the capacity to develop sustainable solutions to environmental problems. Ecological modernization theorists believe that, the environmental problems facing the world today, act as a driving force for future industrial activity and economic development (Mol & Jänicke, 2020).

Furthermore, Jorgenson et. al. (2019) established a link between EMT and economic performance with environmental protection, proving a strong relationship between reverse logistics activities and firm performance. In other words, researches indicates that strategic environmental management, deeply ingrained in technology and policy, drives environmental innovation in the supply chain at both macro-level (government regulation) and micro-level.

Hector and Lambrechts (2024) explained that ecological modernization strives to harmonize the environment and economy by promoting green production using market mechanisms, emphasizing recycling, technological advancements, and ecological pricing, in order to decrease external economic impacts on the environment. This opinion enables this study to approach the issues caused by the manufacturing on the environment with a new perspective from reverse logistics approach.

However, the theory is criticized of been solely for environmental purpose and ignored other aspect of the business environment such as demographic factors, internal organizational resources and technological factors. Despite the above aforementioned criticism some previous studies used the theory in the context of reverse logistics, such studies include (Ngouapegne et. al., 2024; Horsfall et. al., 2024).

Empirical Reviews

Opoku and Li. (2025) investigated sustainable management practices and operational and sustainable performance in the Ghanaian manufacturing context. The study adopts an explanatory research design. Survey instrument was administered to 285 managers in 5,329 manufacturing businesses. The data was analysed with SmartPLS4.1 and structural equation modelling. Findings reveal that, reverse logistics and lean management practices improve firms' operational, social and environmental performance. Despite the fact that, the study's objectives were primarily achieved, but the study limited to Ghana. Thus, this study is conducted in Northern Nigeria in order to enhance the result.

Khan et. al., (2024) empirically examine Reverse logistics practices in relation to competitive advantage among Plastic and Bottle manufacturing industries in Pakistan. A survey design was employed. In this regard, 219 questionnaires were administered. The IBM SPSS and AMOS version 24 were used as supporting statistical analysis and interpretation tools. Results revealed that, a significant impact was examined between reverse logistics and competitive advantage, and a mediating role was confirmed between those variables. However, the study limited to only plastic and bottle manufacturing firms while other manufacturing companies were not included. As a result, this study included all manufacturing firms to expand the result.

Ricardianto et. al., (2022) analyzed the contribution of Green Manufacturing and Green Distribution on improving the performance of GSCM with Reverse Logistics the mediator. The study used quantitative methods with the sample size of 70 respondents. The analysis was carried out using the Path Analysis method. The hypothesis testing was conducted accordingly. The results revealed that, there is a significant contribution of Green Manufacturing, Green Distribution, and Reverse Logistics on the success of GSCM implementation. Hence, firms are recommended to always pay attention to the variables under review.

Ebenezer and Zhuo (2019) investigated Reverse Logistics and Performance with a focus on the Ghanaian manufacturing sector. The respondents to the study are 187 operation managers, logistics managers, and production managers who were randomly selected using a stratified sampling technique. The data collection instrument for the study was a questionnaire. Partial

Least Squares structural equation modeling was used to test hypotheses. The study's findings found that, reverse logistics positively and significantly influence competitive advantage and firm performance. The findings give managers with strategic information to willingly support Reverse Logistics and establish effective product return policies that fulfill both consumers' and society's 'greening' expectations in order to improve their supply chains. Governments and other environmental regulatory organizations were also advised to develop national waste management regulations with the goal of increasing pressure on manufacturers to comply and incorporate Reverse Logistics into their operations. The study's weakness is that only Ghanaian bottled and sachet manufacturing firms were investigated, other manufacturing firms were not considered. As a result, this study investigated firms operating in the entire manufacturing sector in Northern Nigeria.

Another study conducted by Anne et. al., (2016) sought to investigate the relationship between reverse logistics and the competitiveness of food manufacturing enterprises in Kenya. The study investigated the various companies' reverse logistics procedures and then examined whether these activities have any effect on the firm competitiveness of food manufacturers in Kenya. A cross-sectional study of 130 food manufacturing enterprises listed in the Kenya Association of Manufacturers directory was conducted. The overall response rate was 73.8%. The construct validity was examined using factor analysis, while the criterion validity was tested using multivariate linear regression. Findings reveal that, adopting reverse logistics strategies boost the competitiveness of Kenya's food manufacturing enterprises. Furthermore, the study discovered that there is a low level of adoption of reverse logistics methods in Kenya due to a lack of awareness about the relevance of sustainability. Organizational managers were recommended to should be aware of environmental challenges and perform reverse logistics. The study also suggested that the government and all stakeholders in the manufacturing sector conduct public awareness campaigns on the importance of environmental conservation in order to encourage locals to become active drivers in the adoption of reverse logistics practices.

Propositions Development

In view of the extent literature reviewed by this paper, reverse logistics was found to have positive impact on the manufacturing companies as previously found under empirical review of this work. Thus, this paper focuses attention on GSCM practices specifically, which include organizational core tactics such as reverse logistics, and the positive association between reverse logistics practices and improved environmental, operational and financial performance is well established as found in (Geng et al., 2017; Rao & Holt, 2005; Russo & Fouts, 1997; Zhu et al., 2005; Pullman et al., 2009).

The principal objective in this paper is thus to review the previous literature on relationship between reverse logistics practices and manufacturing performance from the dimensions of environmental, operational and financial performance. For the contingencies that affect these relationships, this paper presents the reverse logistics practices environmental, operational and financial performance links as baseline propositions for the purpose of future researcher’s

statistical testing as similarly found in (Kim et al., 2015). In particular, significant cost advantages can result from reverse logistics practices (Carter et al., 2000), such as superior waste management, use of less expensive recycled raw materials, energy consumption, environmental accidents and number of components in products (Jacobs et al., 2010) and pollution prevention, which limits the cost of compliance with environmental regulations (Hart, 1995).

In view of the above review of empirical findings by the previous studies, this paper concludes as follows: -

P1: Reverse logistics has positive and significant effect on environmental performance of manufacturing companies.

P2: Reverse logistics has positive and significant effect on operational performance of manufacturing companies.

P3: Reverse logistics has positive and significant effect on financial performance of manufacturing companies.

Conclusion and Recommendations:

Conclusively, considering the extent reviewed literature and empirical findings from previous studies, it could be concluded that the relationship between reverse logistics and manufacturing performance is positive and significant. However, this is a propositional suggestion that is subject to be tested empirically. Therefore, it is generally recommended that, future empirical studies should be conducted on the relationship between reverse logistics and manufacturing performance in order to extend the result.

Specifically, in line with the reviewed literature and propositions of this study, manufacturing companies are advice to implement the following specific recommendations on reverse logistics with a view to enhancing environmental, operational and financial performance: -

a. Design a take-back system: Encourage customers to return used products for recycling or refurbishment.
b. Implement product recovery: Refurbish or recycle returned products to reduce waste and recover valuable materials.
c. Partner with recycling facilities: Collaborate with recycling facilities to ensure responsible disposal of non-recoverable products.

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