Remanufacturing Practices and Value Chain Performance in the Food and Beverage Industry in Kenya.

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ABSTRACT
With the age of e-procurement and consumer awareness, allowance for product returns is key in ensuring customer satisfaction and customer return. Value chains have been facing challenges such as waste accumulation, scarce resources and high material costs which could be reduced by returning waste products to the value chains for reusing, recycling and remanufacturing. The main objective of this study was to examine the influence of product returns on value chain performance in the food and beverage industry in Kenya. The study adopted a descriptive research design and the target population was 291 companies in the food and beverage industry. The sample population involved 74 companies in the food and beverage industry. Self-administered structured questionnaires were used to collect primary data. Data was analyzed using descriptive and inferential statistics. The study found that value chain performance was influenced positively and significantly by product remanufacturing practices and most of the food and beverage firms in the industry that are implementing remanufacturing practices are improving their value chain performance by minimizing waste and the need to purchase new raw materials thereby increasing operational efficiency. This research was based on remanufacturing practices and value chain performance in the food and beverage industry in Kenya and there is a need to undertake similar studies in retail or commercial sector and in other countries in order to uncover the underlying relationships between remanufacturing practices and value chain performance and the findings may identify interesting comparisons. This study adds to existing research on the subject of remanufacturing practices and value chain performance as it reveals that remanufacturing practices are necessary to promote optimization of the performance of the value chains. Based on the current Literature, studies focusing on the implementation of the remanufacturing practices are limited. There is no study that is linking remanufacturing practices and value chain performance of the food and beverage industry. Therefore, this is a pioneering study in both content and context.

Key Words: Remanufacturing Practices, Reverse Logistics, Value Chain Performance

I.0 INTRODUCTION

1.1 Background of the Study
Reverse logistics practices center around post-buyer waste, which has some value in them that institutions can recover and reintegrate into the value chain as a new asset (Dudubo, 2017). The explanations behind practicing reverse logistics differs from enterprise to enterprise (Chan et al., 2012) and it is practiced in industries like printers, single-use cameras, jet engine parts, cell phones, car parts, laptop parts, steel, chemicals, drugs, and refillable containers. Most organizations carrying out reverse logistics practices such as remanufacturing have a shared objective of assets safeguarding through value recovery and decrease in the volume of waste that winds up on landfills (Mobolaji, 2017). Ismatov (2015) states that the reverse channel actors should offer value adding activities to the value chains to ensure technical and financial viability of the entire cycle. More than simply "reversing" direct logistic streams, reverse logistics systems require the restructuring of parts of the value chain, the proper management of storage and transportation in reverse streams, the possible establishment of new businesses, and the integrated administration of reverse and closed loop supply networks to guarantee efficiency and effectiveness of the processes in question (David, 2014). Balancing economic, environmental and value chain performance has become significant for institutions that face competitive, regulatory and societal pressures. In developed countries, the adoption of remanufacturing practices is more consolidated; however, in developing countries this concept is still considered in the state of infancy, in terms of development (Bouzon et al., 2015). In the developing
economies, some barriers still need to be surpassed to enable the successful implementation of the concept of remanufacturing practices, which covers aspects related to technology and infrastructure; governance and supply chain process; financial/economics; knowledge; policies; market and competitors; and management (Abdulrahman et al., 2014). Moreover, Prakash and Barua (2015) have named other challenges for remanufacturing in the coming years, especially those related with the marketing of the recovered products, namely competition issues in remanufacturing, the cannibalization problem, and the purchase intention of consumers of remanufactured products, their perceptions and willingness to pay for this sort of products.

1.2. Problem Statement
The COVID-19 outbreak in the first quarter of 2020 resulted in economic slowdown across the globe as countries put in place measures to mitigate the spread of the virus. These measures restricted movement (KAM, 2021). Industrial hubs bore the bigger brunt as disruption in supply chains and subdued consumer demand led to a decline in global manufacturing production. The contraction was witnessed in both manufacture of food and non-food products. Value added by the sector dropped to Ksh. 183 billion in 2020 Q3 from KSh.191 billion in 2020 Q1. The Kenyan economy is estimated to have contracted by 1% in 2020 compared to a 5.4% growth in 2019 (World Bank, 2020). The pandemic resulted in reduced consumer demand both globally and locally, disruption of supply chains and value chains, job losses coupled with the COVID-19 prevention measures announced by the government, most economic activities in the service sector that demand manufactured goods such as the hospitality industry came to a near halt. The Russia-Ukraine war disrupted the chances of global economic recovery from the COVID-19 pandemic. The war between these two countries led to economic sanctions on multiple countries, a surge in commodity prices, and supply chain disruptions, causing inflation across goods and services and affecting many markets across the globe. Value chain efficiency is confronted with dramatic shifts in the market climate and cost control, limiting value chain executives' capacity to respond to these changes. Despite the prevalence of demand-driven slogans, consumer intimacy is minimal, with companies becoming more linked to their vendors than their clients. It is clear that manufacturing organizations are operating at a less competitive stance. Inefficient value chain management has been accredited to this poor performance (Mutunga, Magutu & Chirchir, 2015). In addition to this, food and beverage manufacturing companies in Kenya have been experiencing declining profitability in their production and operations management (KAM Directory, 2019). Low performance of the firms is caused by problems such as; scarce resources, waste accumulation, high material cost, disposal and lack of sustainability. The weak performance can be attributed to high operations cost and wastes in the entire value chain, which ought to be addressed through adoption of reverse logistics practices (Bor, & Ngugi, 2014).

Despite the identification of reverse logistics practices such as remanufacturing as a technique of optimizing value chain performance, KNBS (2017) indicated that 65% of manufacturing firms in Kenya often focus on forward logistics and as a result, they tend to overlook the importance of reverse logistics activities and its potential of value addition to the value chain processes and various organizations. Documented studies in this area include (Bor, & Ngugi, 2014) “Green Supply Chain Management Practices and Performance of Food and Beverage Processing Sector in Kenya”, Abdi (2012) “Value Chain Performance and the Profitability of Indigenous Petroleum Marketing Firms in Kenya”, Akenbor and Okoye (2011) “An empirical investigation of value-chain analysis and competitive advantage in the Nigerian manufacturing industry”,

1.3. Research Hypothesis
To fulfill this objective, we aimed at testing the hypothesis H01: There is no statistically significant link between remanufacturing practices and value chain performance in the food and beverage industry.

2.0 Literature Review
2.1. Theoretical Review
2.1.1 Resource-Based View (RBV) Theory
Penrose (1959) viewed firms as a bundle of resources which when properly manipulated enables them to achieve competitive advantage which in turn leads to superior long-term performance. Developments on the
RBV theory have directed attention towards the nature of resources and their positioning that might create barriers and economic dents for competitors (Bohnenkamp, 2013). Resource-based view (RBV) explains how the unique deployment and combination of tangible and intangible resources might assist companies to achieve a sustainable competitive advantage because capabilities are more difficult to imitate or substitute and therefore add greater value to the firm (Priem & Swink, 2012). It argues that for a firm to gain competitive advantage, it must possess resources that are rare, difficult to imitate, non-substitutable and valuable. In this regard, Bohnenkamp (2013) identified value, rarity, imperfect imitability and imperfect substitutability as essential characteristics of resources to generate barriers and advance competitive advantage.

However, Chae (2014) postulated that RBV considers a network resource notion to use its explanatory power in value chain environments. Applications of RBV in value chain management are mainly focused on structural analysis and identification of the antecedents for competitive advantage in the value chain (Pearson, Masson & Swain, 2010) since majority of value chain management decisions are underpinned by RBV, at least implicitly. In order to respond to uncertainties and changes, companies form inter-organizational arrangements to enjoy resource-position barriers built through collaborative efforts. This is particularly true in situations where scarce resources or intense competition make organizations realize that relying only on internal resources is insufficient to secure competitive advantage.

This theory is relevant to this study as it supports remanufacturing practices as it enables an organization to find the resources at their End of Use stage, both in and outside an organization that can be reworked to give further value to an end consumer. This is done in a bid to add value to their value chains and satisfy consumer needs with the finite resources available in the market. This is instrumental in the fact that an organization optimizes the use of its resources thus gaining competitive advantage and reducing the overall costs spent in the production process therefore increasing its revenue and promoting value chain performance.

2.2 Conceptual Framework

<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>Dependent Variable</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Remanufacturing</strong></td>
<td><strong>Value Chain Performance in the Food and Beverage Industry</strong></td>
</tr>
<tr>
<td>Production costs</td>
<td>Efficiency</td>
</tr>
<tr>
<td>Sales volumes</td>
<td>Quality</td>
</tr>
<tr>
<td>Profit margins</td>
<td>Degree of Responsiveness</td>
</tr>
<tr>
<td>Competitiveness</td>
<td>Flexibility</td>
</tr>
</tbody>
</table>

Figure 1: Conceptual Framework

2.3 Empirical Review of Remanufacturing Practices

Wainaina (2014) states that remanufacturing is a form of reverse logistics practice that uses an industrial process where a previously sold, leased, used, worn or non-functional product or part is returned to a like-new, same-as-when-new, or better-than-when-new condition from both a quality and performance perspective, through a controlled, reproducible, and sustainable process. Generally, remanufacturing firms collect used products in order to improve on their efficiency or usability after which they are resold back to consumers. In remanufacturing, a firm collects all used products from the customers thus the timing and quality of the used products are usually unknown. In the past, remanufacturing was typically limited to supporting business to consumer (B2C) warranty, customer returns, and business to business (B2B) return of capital-intensive “core” products (such as engines and industrial goods) to long-term service, within a domestic or regional marketplace. While these applications remain, new reasons for entering the remanufacturing market are growing such as new market development, customer service, value-chain development, sustainability and research and development.

Remanufacturing directly serves the growth of the reverse supply chain, sustainability and value-chain, and research and development. In addition, it serves more traditional functions including warranty, maintenance
repair, and overhaul (MRO), and customer request. Combined, remanufacturing increasingly supports high-priority goals, competitive practices, and critical customer service functions (APICS, 2022). Achieving profitability in remanufacturing, in part, relies on operations management which seek to maximize flow and yield, despite constant variation. Remanufacturing follows the following steps; After acquisition, a product undergoes an initial examination to confirm it is suitable for remanufacturing. The product, or the core of the product, must be free from unusual wear, damage, or missing components that would otherwise disqualify it. This step may also capture precise data about the condition or state of the product in order to document, plan, or refine future remanufacturing production schedules and component inventory levels. Then there is disassembly which seeks to balance speed and productivity while preserving as much product or component value as possible. Where possible, disassembly reverses original new product assembly steps. In other cases, where a product was not designed for remanufacturing, disassembly may create damage (while this damage will be restored in later steps, it can be costly to the remanufacturing business). The depth of disassembly is governed by determining what is needed to ensure the remanufactured product meets new product specifications and capabilities (APICS, 2022).

After disassembly, there is component inspection and decontamination which evaluates and identifies components for further processing. This step may discard some components while retaining others. Retained modules and components typically undergo recovery cleaning or decontamination to remove the by-products of use, wear, or aging. Then components discarded in the previous step are replaced from remanufacturing component inventories. Remaining components are restored to like-new condition. In a remanufacturing inventory-pool model, final reassembly proceeds when inventory levels call for additional remanufactured stock. An inventory pool ensures that a remanufactured product immediately ships upon receipt of a used product. Reassembly may also involve steps where remanufactured goods are required by law to be labeled, documented, or tracked. Then, products undergo quality assessment to ensure each objectively meets the standards of newly manufactured products. This may involve testing every product to satisfy regulatory or marketing claims. This step may also document specific quality assurance data as required by the customers, regulators, or industry practice (APICS, 2022).

Remanufacturing relies on a supply chain of original product buyers to become suppliers to the remanufacturing process. This reversal creates and preserves value for three parties: the owner of the worn product who sees value when a remanufacturer offers an acquisition price higher than the products scrap value, the remanufacturer who sees value in acquiring a worn product at a price that does not include much of the energy, labor, material and design expense originally expended to create the product when new and the future buyer of the remanufactured product who sees value in acquiring a product as good as new but at a lower price than the new production product cost. The remanufacturing marketplace helps to establish competitive ongoing value to all parties.

Eventually, a remanufactured product will be refurbished, recycled, or scrapped when remanufacturing is no longer profitable. This may occur even if a remanufactured unit remains physically capable of serving its purpose in its market. Part of the reason for this is the difficulty of global trade for many remanufactured products. In many nations, remanufacturing is active in the areas of transportation equipment, computer or telecommunications devices, medical devices, audio or visual instruments and commercial and industrial equipment (particularly in agriculture, mining, construction, printing-copying, utilities, heating and air conditioning, baking, vending, and musical instruments). However, current trends are changing because remanufacturing is well suited to products, industries, and market trade where products have durable or long life spans, high cost or complexity when new which helps create value for remanufacturing, market and regulatory recognition or approval of remanufactured products, predictable wear or usage patterns and standardized designs even over multiple product versions or generations (Wainaina, 2014).

Businesses see remanufacturing opportunities particularly where: Industries recognize product value not just for product materials but for their inherent design, intellectual property, or regulatory approved status; Markets accept and trust the “as-good-as-new” concept; Good customer service and support ensure remanufactured products become solutions, not just price-sensitive commodity items. The process of remanufacturing is beneficial to remanufacturing firms and their value chains in a number of ways. For one, remanufacturing firms are not required to produce new products from scratch. This means that there is a
huge cut down on the costs of generating raw materials to make new products. In fact, the cost of raw materials for many such firms is reduced by over 70 per cent (Barnes, 2010). Since the consumers are expected to return used and faulty products to the remanufacturing firm, the process saves the firm almost all its transport costs. Transport costs are a major barrier to profit maximization which is the main objective of the firm. For remanufacturing firms, transport costs are only incurred while transporting remanufactured products back to the consumer (APICS, 2022). Through remanufacturing, firms are able to produce a large variety of products in the market within a short period of time. Remanufacturing practices enable manufacturing firms to achieve an efficient value chain networks that are able to save costs and deliver quality products to customers (Wainaina, 2014).

3.0 Research Methodology

3.1. Research Design
This is the outline, plan or scheme that is used to generate answers to a research problem. This study adopted a descriptive research design as it is more investigative and focuses on a particular variable factor (Ott & Longnecker, 2010). It describes what is in existence in respect to conditions or variables that are found in a given situation. A case study is a research method involving an up-close, in-depth, and detailed examination of a subject of study, as well as its related contextual conditions. In this study data was collected to show the role of remanufacturing practices on value chain performance in the food and beverage industry in Kenya.

3.2. Population
Ott and Longnecker, (2010) define the target population as the complete collection of objects whose description is the major goal of the study. According to the Manufacturers and Exporters Directory (2022) data, the total number of companies in the food and beverage industry is 291 but the target population for the study is 74 companies in the food and beverage industry which have implemented the remanufacturing practices in their organizations and value chains.

3.3. Sample Size and Sampling Technique
A sample size refers to the number of items to be selected from the universe (population) to constitute a sample (Kothari, 2014). The sample size depends on what one wants to know, the purpose of the inquiry, what is at stake, what is useful, what has credibility and what can be done within the available time and resources. The researcher applied the statistical formula by Yamane (1967) in order to derive the sample size. The formula is:

\[ n = \frac{N}{1+N(e)^2} \]

Where:
- \( n \) = sample size
- \( N \) = total population
- \( l \) = constant
- \( e \) = error term (0.1)

This gave a sample size of 74 organizations in the Food and Beverage industry. Purposive sampling was used to select the 74 organizations under consideration in this study. Kothari (2014) states that under purposive sampling, the researchers deliberately choose the units of study to constitute the sample on the basis that the small mass they select out of the huge one will be a typical representative of the whole. For instance, in this study, not all organizations in the food and beverage industry can conduct reverse logistics as some products such as food waste, food-tainted items (such as: used paper plates or boxes, paper towels, or paper napkins), plastic wrap, packing peanuts, bubble wrap and wax boxes which are used in packaging cannot be reused or remanufactured for the same or a similar purpose. Similarly, not all organizations in the food and beverage industry have implemented remanufacturing therefore only organizations that have implemented remanufacturing practices were considered.

3.4. Data Collection Instrument
This research used structured questionnaires as a data collection instrument. Questionnaires were used since according to Cooper and Schindler (2014), they are effective data collection instruments that allow respondents to give much of their opinions in regard to the research problem. Questions in the instruments
were structured in a way that they address various aspects of the study variables. This method is more confidential, easier to administer and to analyse, economical and time saving as compared to the other instruments thus it was appropriate for this study. The researcher did a preliminary study where she contacted all the companies under study to find out whether they conduct any remanufacturing practices before administering the questionnaires to the respondents.

4.0 Data Analysis and Interpretation

4.1 Response Rate
Response rate refers to the extent to which the final data sets includes all sample members and is calculated as the number of respondents with whom interviews are completed (Kothari, 2014). The researcher distributed 74 questionnaires and 72 questionnaires were completed by the respondents representing a 97% return rate as shown in Table 4.1.

<table>
<thead>
<tr>
<th>Operations Officers</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>72</td>
<td>97%</td>
</tr>
</tbody>
</table>

4.2 Reliability Analysis
The reliability of a measure denotes the consistency of results obtained in the use of a particular instrument and is an indication of the extent of random error in the measurement method (Kothari, 2014). To ensure reliability of measurement in relation to the consistency, accuracy, and precision of the measures to be taken in the use of the research instrument and to ensure that there was no bias during the study, Cronbach’s alpha method was used to measure the consistency of the questions in the questionnaire. It ranges between 0 and 1 and acceptable alpha should be at least 0.70 (Mugenda & Mugenda, 2003). Table 4.2 shows the output from the reliability of statements measuring each individual variable.

<table>
<thead>
<tr>
<th>Independent/ Dependent Variables</th>
<th>Number of Items</th>
<th>Cronbach’s Alpha value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remanufacturing</td>
<td>6</td>
<td>0.878</td>
</tr>
<tr>
<td>Value Chain Performance</td>
<td>19</td>
<td>0.926</td>
</tr>
</tbody>
</table>

4.3 Descriptive Statistics
The respondents were questioned on various indicators of remanufacturing practices on value chain performance. Their responses were rated on a 5 points Likert scale in which they either stated strongly disagree (SD), disagree(D), neutral(N), agree(A) and strongly agree(SA). The results were expressed in percentages as shown in Table 4.3.

<table>
<thead>
<tr>
<th>Statement</th>
<th>SD</th>
<th>D</th>
<th>N</th>
<th>A</th>
<th>SA</th>
<th>Mean</th>
<th>Std.Dev</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remanufacturing enhances our organization value chain</td>
<td>4</td>
<td>24</td>
<td>11</td>
<td>31</td>
<td>31</td>
<td>3.60</td>
<td>1.26</td>
</tr>
<tr>
<td>Remanufacturing helps our organization to reduce our production costs</td>
<td>3</td>
<td>26</td>
<td>6</td>
<td>31</td>
<td>35</td>
<td>3.68</td>
<td>1.28</td>
</tr>
<tr>
<td>Our company sales volumes have increased due to remanufacturing</td>
<td>0</td>
<td>24</td>
<td>8</td>
<td>33</td>
<td>35</td>
<td>3.79</td>
<td>1.16</td>
</tr>
<tr>
<td>Through successful remanufacturing our organization is able to raise our profit margins substantially</td>
<td>4</td>
<td>19</td>
<td>10</td>
<td>29</td>
<td>36</td>
<td>3.76</td>
<td>1.26</td>
</tr>
<tr>
<td>Our organization is able to produce a large variety of products in the market within a very short time</td>
<td>3</td>
<td>11</td>
<td>21</td>
<td>33</td>
<td>32</td>
<td>3.81</td>
<td>1.10</td>
</tr>
<tr>
<td>Remanufacturing increases our organizations competitiveness in the market</td>
<td>1</td>
<td>22</td>
<td>4</td>
<td>35</td>
<td>38</td>
<td>3.85</td>
<td>1.19</td>
</tr>
</tbody>
</table>

Respondents were asked whether remanufacturing enhances their value chain. 4% of the respondents strongly disagreed, 24% disagreed, 11% chose neutral, 31% agreed and 31% strongly agreed. Respondents were also asked whether remanufacturing helps their organization to reduce their production costs. 3% of the
respondents strongly disagreed, 26% of the respondents disagreed, 6% chose neutral, 31% agreed and 35% strongly agreed that remanufacturing leads to decreased production costs. The respondents were also asked whether remanufacturing has increased their company sales volumes. 24% of the respondents disagreed, 8% chose neutral, 33% agreed that sales volumes have increased and 35% of the respondents strongly agreed. Respondents were asked whether remanufacturing has led to increased profit margins in their organization. 4% of the respondents strongly disagreed, 19% of the respondents disagreed, 10% of the respondents chose neutral, 29% of the respondents agreed and 36% of the respondents strongly agreed. Respondents were also asked whether they are able to produce a large variety of products within a very short time due to remanufacturing. 3% of the respondents strongly disagreed, 11% disagreed, 21% chose neutral, 33% agreed and 32% strongly agreed. Lastly, the respondents were asked whether remanufacturing increases their competitiveness in the market. 1% of the respondents strongly disagreed, 22% of the respondents disagreed, 45 of the respondents chose neutral, 35% of the respondents agreed and 38% of the respondents strongly agreed.

The findings of this study indicated that remanufacturing influences value chain performance of an organization. This is shown by a majority of the respondents who agreed that remanufacturing enhances their value chains, reduces their production costs, increases their sales volumes, increases their profit margins and increases their competitiveness in the market and improving the performance of their value chains. In addition, the findings were supported by Mogaka (2015) who found that remanufacturing is recognized for reducing production costs, increasing sales volumes, increasing profit margins and increasing competitiveness in the market.

4.4 Inferential Statistics

4.4.1 Test for Normality

For purposes of this study, Kolmogorov-Smirnov and Shapiro-Wilk tests were used to test for normality. As a rule of thumb, (Thode 2002) Kolmogorov-Smirnov is used for small samples and for large samples, Shapiro Wilk test is adopted. The test statistic for normality is p>.05. P-values greater than 0.05 indicates that the data is normally distributed. On the contrary, a P-value <0.05 indicates that the data is not normally distributed. Table 4.4 below shows the significance levels of remanufacturing practices (p=0.131) and value chain performance (p= 0.575). From the table, we can conclude that all the variables exhibit a normal distribution. Hence the data satisfies the first assumption of regression that for one to conduct regression analysis, data must be normally distributed.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Kolmogorov-Smirnov*</th>
<th>Shapiro-Wilk</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Statistic</td>
<td>df</td>
</tr>
<tr>
<td>Remanufacturing Practices</td>
<td>.121</td>
<td>72</td>
</tr>
<tr>
<td>Value Chain Performance</td>
<td>.075</td>
<td>72</td>
</tr>
</tbody>
</table>

*a. Lilliefors Significance Correction

To corroborate the skewness and kurtosis results, the graphical representation showed the line signifying the actual data distribution closely follow the diagonal in the normal Q-Q plot as illustrated in Figures 4.1 and 4.2 below, connoting normal distribution (Lorenzo-Arribas, 2019). In Q-Q plot, or the normal probability plot, the observed value for each score is plotted against the expected value from the normal distribution, whereby, a sensibly straight line implies a normal distribution and if the points in a Q-Q plot depart from a straight line, then the assumed distribution is called into question. Looking at the above Q-Q plots for all the variables the departure from normality is non-existent, this corroborates the Shapiro Wilk test for normality.
Figure 4.1: Q-Q Plots for Remanufacturing Practices

Figure 4.2: Q-Q Plot for Value Chain Performance

4.5 Simple Linear Regression

4.5.1 Remanufacturing Practices and Value Chain Performance

R is the correlation coefficient (simple correlation coefficient) measures the strength and direction of the linear relationship between the recycling practices and value chain performance. In this case, the R value is 0.531, indicating a moderate positive relationship between the predictor (remanufacturing as a reverse logistics practice) and the dependent variable (value chain performance). R Square represents the coefficient of determination and it indicates the proportion of variance in the dependent variable that can be explained.
by the remanufacturing practices. In this case, the R-squared value is 0.384, meaning that approximately 38.4% of the variance in the value chain performance can be explained by the remanufacturing practices. The adjusted R-squared value takes into account the number of predictors and sample size, providing a more conservative estimate of the proportion of variance explained. In this case, the adjusted R-squared value is 0.376. Std. Error of the Estimate value is 0.30362 which represents the standard deviation of the residuals, providing an indication of the average distance between the observed and predicted values.

Table 4.5: Model Summary of Remanufacturing

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std. Error of the Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.620†</td>
<td>.384</td>
<td>.376</td>
<td>.30362</td>
</tr>
</tbody>
</table>

The ANOVA table below examines the overall significance of the regression model. The regression sum of squares of 4.030 represents the variability in the dependent variable explained by the predictor variable; remanufacturing as a reverse logistics practice. The residual sum of squares value of 6.453 represents the unexplained variability or error term in the model. The total sum of squares is 10.483 and accounts for the sum of the regression sum of squares and the residual sum of squares. The F-statistic = 43.717 and it tests the overall significance of the regression model. With a p-value of .000, which is less than the conventional significance level of .05, we can conclude that the regression model is statistically significant. This suggests that the remanufacturing as a reverse logistics practice has a significant impact on value chain performance.

Table 4.6: ANOVA of Remanufacturing

<table>
<thead>
<tr>
<th>Model</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Regression</td>
<td>4.030</td>
<td>1</td>
<td>4.030</td>
<td>43.717</td>
</tr>
<tr>
<td></td>
<td>Residual</td>
<td>6.453</td>
<td>70</td>
<td>.092</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>10.483</td>
<td>71</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The coefficients table below shows that the constant term 1.9442 represents the expected value of the dependent variable value chain performance when the remanufacturing as a reverse logistics practice is at zero.

The coefficient for remanufacturing as a reverse logistics practice (0.494) indicates that a one-unit increase in the recycling practices is associated with a 0.494 increase in value chain performance. The standardized coefficient (beta) of 0.620 suggests a moderate positive relationship.

Table 4.7: Coefficients of Remanufacturing

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>Std. Error</td>
<td>Beta</td>
<td></td>
</tr>
<tr>
<td>(Constant)</td>
<td>1.942</td>
<td>.282</td>
<td>.620</td>
<td></td>
</tr>
<tr>
<td>Remanufacturing Practices</td>
<td>.494</td>
<td>.075</td>
<td>.620</td>
<td>6.612</td>
</tr>
</tbody>
</table>

The specific model;

\[ Y = \beta_0 + \beta_1 X_4 + \epsilon \]

Value Performance = 1.942 + 0.494 Remanufacturing Practices

4.6 Hypothesis Testing

The test of hypothesis was conducted using the Ordinary Least Square Regression. The acceptance/rejection
criteria was that, reject the null hypothesis if the p-value is less than the convectional 0.05. Fail to reject the null hypothesis if the p-value is higher than the convectional 0.05.

H₀₃: Remanufacturing does not have a significant effect on value chain performance in the food and beverage industry in Kenya.

The null hypothesis was that remanufacturing does not have a significant effect on value chain performance in the food and beverage industry in Kenya. Results in Table 4.32 indicates that p-value (0.000) was less than the convectional p-value (p= 0.05). This demonstrates that remanufacturing practices have a significant effect on performance in food and beverage industry in Kenya. Otherwise put, the role of remanufacturing practices in determining the value chain performance in the food and beverage industry in Kenya cannot be ignored. In conclusion, we reject the null hypothesis H₀₃: Remanufacturing does not have a significant effect on value chain performance in the food and beverage industry in Kenya.

5.0 Conclusions and Recommendations

From the study findings, it can be concluded that product returns practices had a positive significant influence on value chain performance of the firms in the food and beverage industry in Kenya. This is because an increase in a unit of product returns practices leads to an improvement of the performance of the value chains in the food and beverage industry. The study recommends leveraging automation to ensure syncing of the product returns processes to ensure streamlining of the returns management processes to foster efficiency in their value chains. The study recommends that the logistics infrastructures of the forward and reverse logistics should be streamlined to ensure efficient returns of the products from the consumers to the manufacturing firms just as efficient as it is to move finished products from the manufacturing organizations to the final consumers. The study also recommends that the food and beverage manufacturing firms should determine where they can use their resources more effectively in order to cut costs and boost output which could entail making investments in cutting-edge technology or optimizing operations. The study also recommended that a system for the management of knowledge should be purchased by food and beverage manufacturing companies in order to standardize and oversee the sharing of knowledge across the value chain. Also, in order to increase communication with logistics partners and cut down on supply chain delays, these companies should also provide crucial information on load preparation, freight invoicing, optimum routes, and tender activities dealing with the returns management. The study also recommended that the food and beverage industry regulators should devise policies that would allow food and beverage manufacturers to integrate their value chains to help avoid losses that impact the efficiency of these businesses and eventually the economy as a whole.

References


