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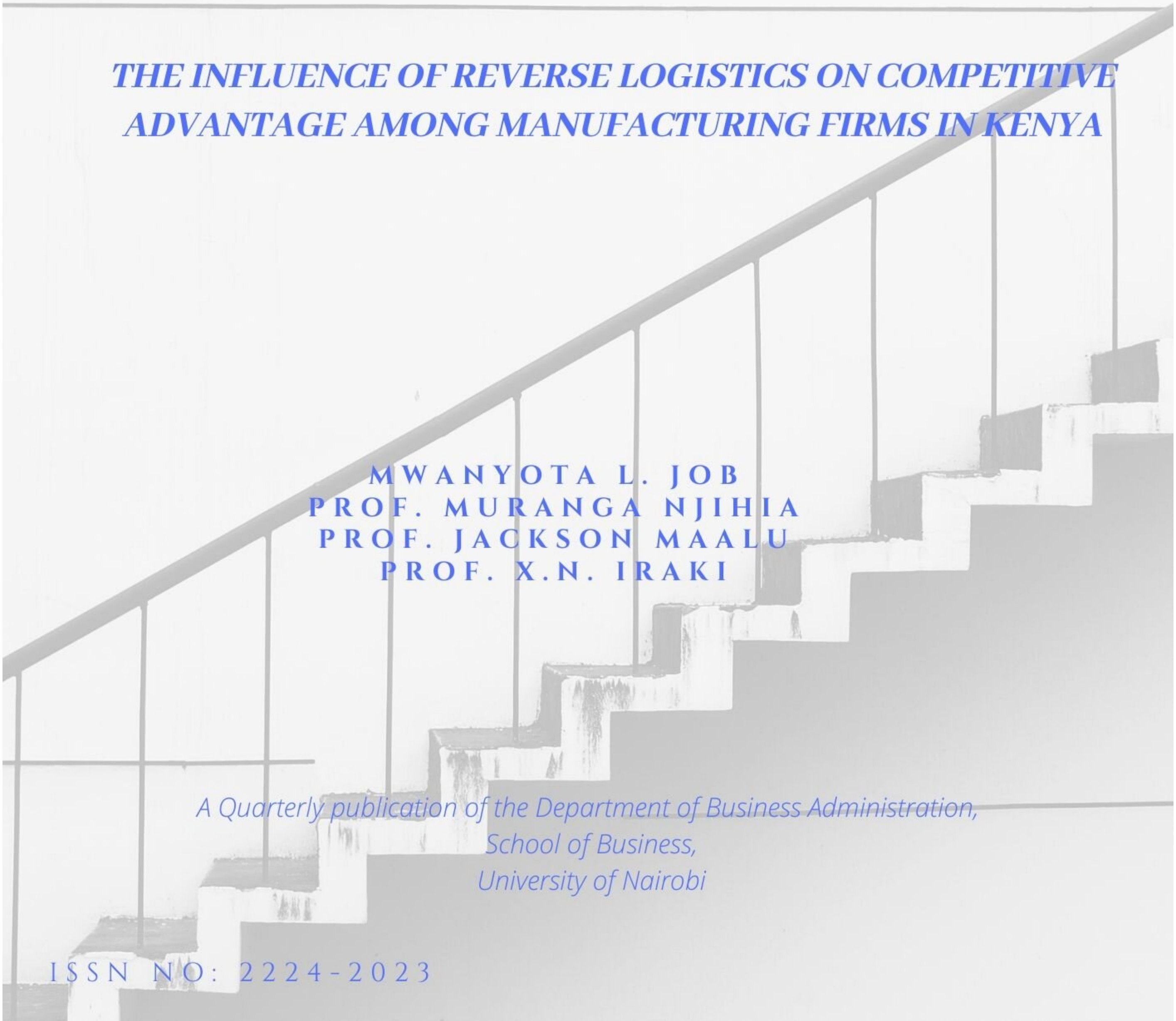

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THE INFLUENCE OF REVERSE LOGISTICS ON COMPETITIVE ADVANTAGE AMONG MANUFACTURING FIRMS IN KENYA

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Abstract

Today globally, countries and manufacturing entities alike are concerned with environmental sustainability. Execution of reverse logistics strategies has been contemplated as a feasible alternative to mitigate the negative environmental effects of manufacturing. However the question has been whether implementing reverse logistics creates competitive advantage for manufacturing entities. Specifically, the study objective was to establish the influence of reverse logistics on competitive advantage among manufacturing firms in Kenya. Using correlation cross-sectional survey design, primary data were collected among KAM registered manufacturing firms in Kenya using a semi-structured questionnaire. A response rate of 44.4% was attained. Covariance-based, Structural Equation Modeling (SEM) was used in data analysis. Results from the hypothesis test revealed a statistically significant influence of reverse logistics on a firm's competitive advantage. The study thus confirmed that implementation of reverse logistics strategies would lead firms to experience increased customer loyalty, increased market share, improved brand recognition and an increase in revenues. The study recommended that manufacturing firms should implement reverse logistics as an integrated intervention consisting of outsourcing, collaborative enterprising, green strategies and closed-loop supply chain approaches to achieve organizational and environmental benefits. The study further recommended that implementation of reverse logistics should be guided by a process that requires identifying the uniqueness of resources the organization has and strategically placing these resources in a manner that builds comparative advantage. The study suggested that future researchers could replicate this study using direct measures for all the study variables. Further making intra-industry or intra-sectoral comparisons would also be useful in generating knowledge on the implementation of reverse logistics.

Key Words: Reverse Logistics, Competitive Advantage, Covariance-based SEM, Kenyan Manufacturing Firms

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INTRODUCTION

As a way of addressing the repercussions of climate change, the emphasis of the United Nations (UN) has been for countries and businesses alike to reexamine their value chains in order to devise new and sustainable business models that create sustainable supply chains (United Nations Environment Programme (UNEP), 2016). Environmental concerns presently have led manufacturing firms to redesign their processes in order to have environmentally friendly manufacturing (Govindan, Soleimani & Kannan, 2015; Prakash, Barua & Pandya, 2015). These environmental concerns and effects of climate change together with scarcity of manufacturing raw materials and technological advancements have increased attention and focus on reverse logistics (Blumberg, 1999; Dias & Braga Jr., 2016). As a result, manufacturers and consumers alike are required to dismantle used products into their constituent parts for reuse, recycling, or safe disposal (Sheth, Sethia & Srinivas, 2011). Reverse logistics is concerned with moving "end of useful life" goods from consumers to manufacturers so as to recapture value or ensure environmentally friendly disposal (Stock, 1992). By strategically managing product returns this can lead to improving a firm's competitory position.

According to Stock (1992) reverse logistics entails logistics activities relating to recycling and disposal of waste and hazardous materials management. Reverse logistics as a process systematically involves the cost-effective planning, implementation, and control of the efficient movement of raw materials, partly completed and finished products, and the associated information from their usage locale back to their origin either to reclaim value or for apt disposal (Rogers & Tibben-Lembke, 1999). Factors leading to increased volumes of reverse product flow include; lowering of product quality; liberal returns polices; buyer's changing preferences; increased internet product purchases; and shortened product life cycles (Bernon & Cullen, 2007; Ravi & Shankar, 2015). The strategies proposed to implement reverse logistics programs include outsourcing, collaborations, adopting green strategies or implementing reverse logistics from a product-life cycle approach using closed-loop supply strategy. Outsourcing enables a firm to concentrate on its core capabilities, achieve higher flexibility and transfer risk to a third party (He & Wang, 2005; Moghaddam, 2015; Hsu, Tan & Mohamad-Zailani, 2016). Collaborations led by industry associations or governments can integrate reverse logistics operations for firms in an industry (Hung-Lau & Wang, 2009). Adopting green strategies such as reuse, recycle and remanufacture help in "greening" the supply chain (Rogers & Tibben-Lembke, 2001; Rao & Holt, 2005). Finally, implementing reverse logistics using the product-life cycle approach allows for the recreation of value through the closed-loop supply chain (Closs, Speier & Meacham, 2011; Govindan et al., 2015; Sangwan, 2017).

Competitive advantage refers to the unique ability in a firm that enables it to have higher returns than its competitors (Kim & Hoskisson, 2015). To have competitive advantage firms need to offer distinct value propositions using customized value chains with unique trade-offs from those of its competitors (Porter, 2008). Building the product returns process to generate new market opportunities creates competitive advantage by attracting new clients and retaining existing ones (Jayaraman & Luo, 2007). Reverse logistics has facilitated the generation of competitive advantage through influencing the purchasing behavior of customers based on how the product returns are handled (Stock, Speh & Shear, 2006). Barney (1991) identified properties that permit the sustainable realization of competitive advantage to include resource value, the rarity of the resource, an imperfectly imitable resource, an imperfectly mobile resource and a non-substitutable resource. Markley and Davis (2007) suggested customer loyalty, waste reduction, revenue increase, market share, and brand recognition as indices for measuring competitive advantage. Jayaraman and Luo (2007) similarly suggested customer relations, brand image and reputation as ways of assessing a firm's competitive advantage.

Although manufacturing firms globally are increasingly recognizing the importance of conserving the environment, implementation of strategies such as reverse logistics aimed at reducing environmental effect has been slow (KAM, 2018). This is because manufacturing firms have information systems tailored to optimize forward logistics but similar systems for implementing reverse logistics have persisted at the planning stage. Similarly the development of asset value recovery systems is also at its infancy (Dekker, Fleischmann, Inderfurth & van Wassenhove, 2013). Reverse logistics requires additional infrastructure such as warehousing space, additional materials handling equipment and transportation vehicles, a factor which not many firms are willing to invest in (Rogers, Banasiak, Brokman, Johnson & Tibben-Lembke, 2002). Further developing accurate demand forecasts for reverse logistics is more intricate compared to forecasting for forward logistics as a consequence of complexities of tracking defectives. Currently most organizations tend to control product return processes at the individual business unit level and not as a supply chain. Finally the increasing volume of returns greatly exceeds the capacity of business units to manage reverse logistics effectively (Genchev, Glenn-Richey & Gabler, 2011).

A key assumption has been that reverse logistics strategies facilitate sustenance of future generations to fulfill their needs by holding present generations environmentally accountable to all shareholders including the number one shareholder, planet earth (Sheth et al, 2011; Dias & Braga Jr., 2016; Sangwan, 2017). Although reverse logistics has been argued to potentially create sustainable competitive capabilities research in supply chain has not given it considerable attention until recently (Zhikang, 2017). Similarly the uptake of reverse logistics programs by firms has been slow due to the challenges associated with implementation (Huscroft, Skipper, Hazen, Hanna & Hall, 2013). Studies done in reverse logistics have been exploratory using case study research design (Jim & Cheng, 2006; Jayaraman & Luo, 2007; Hung-Lau & Wang, 2009; Genchev et al., 2011). More recently studies are using survey designs with regression modeling but with disparate results (Ho, Choy, Lam & Wong, 2012; Somuyiwa & Adebayo, 2014; Ravi & Shankar, 2015). These studies have also used varied sampling procedures with varying response rates (Ravi & Shankar, 2015; Hsu et al., 2016). Further, only until recently have we seen research on reverse logistics in the African context (Somuyiwa & Adebayo, 2014; Kwateng, Debrah, Parker, Owusu & Prempeh, 2014; Meyer, Niemann, Mackenzie & Lombaard, 2017). To account for differences across contexts and due to the prominence of developing economies in global business more research on reverse logistics needs to be done.

In spite of Kenya's position in East Africa as the most industrially developed country, the manufacturing field is not dominant compared to the service and agricultural sectors (Kenya Association of Manufacturers (KAM), 2018). Growth in the manufacturing sector stood at 3.5% in 2016. Overall, investments in the manufacturing sector stood at Kshs. 277.4 billion in 2016 with 300,900 persons formally employed in the manufacturing sector and representing 11.8% of the formal jobs in the country (KNBS, 2017). Further the manufacturing sector contributed 11.8%, 11.0%, 10.7%, 10.0% and 10.3% to GDP in the years 2012, 2013, 2014, 2015 and 2016 respectively. As a consequence of environmental concerns and climate change, legislation requiring manufacturers to be environmentally conscious have been developed. Through the Environmental Management and Co-ordination Act (EMCA) No.8 of 1999, Kenya established the National Environmental Management Authority (NEMA) to be the government's arm mandated to implement policies concerning the environment. Similarly through the Kenya Green Economy Strategy and Implementation Plan (K-GESIP), Kenya is adopting various green economy approaches and policies (KNBS, 2017). Despite these, uptake of strategies to mitigate environmental effects among manufacturing firms has been slow with firms being more profit-oriented (World Bank, 2018).

Manufacturing firms in Kenya in their quest to gain competitive advantage have not harnessed the potential of implementing reverse logistics programs. The main reason is that developing and implementing such a program has been considered to be a tedious process because of the complexities in developing demand forecasts for reverse logistics and capital requirements for additional infrastructure (Rogers et al., 2002). Similarly, a lack of information systems and asset recovery systems to support informed decision making while developing reverse logistics programs further complicates implementation (Dekker et al., 2013). The Kenyan manufacturing sector has also witnessed the exploitation of the weak institutional mechanisms for enforcing environmental legislation despite initiatives such as K-GESIP (World Bank, 2016). This study sought to establish the influence of reverse logistics on competitive advantage among manufacturing firms in Kenya.

LITERATURE REVIEW

This research was anchored on the transaction cost theory that is guided by certain key premises. First, the basic unit of analysis for firms is a transaction and transaction cost optimizing behaviour is useful in studying firms (Williamson, 1991). Secondly, in optimizing transaction costs, the key is in balancing between transactions that have different attributes and governance structures with different costs and competences (Clemons & Row, 1992). Thirdly, transaction costs are classified into coordination costs which are costs of decision making while integrating economic processes and transaction risk costs referring to the exposure of exploitation in the economic relationship (Geyskens, Steenkamp & Kumar, 2006).

Fourth, the *risk* of opportunism exists in transactions. Opportunism refers to the disclosure of distorted or incomplete information with an aim to mislead, confuse or obscure others (Williamson, 1991). Fifth, the theory provides a framework for explaining why some operations are executed in-house whereas others are outsourced (Coase, 1937). Transaction cost theory becomes relevant to this study in the following ways. At the strategic level the theory provides a framework of how firm structure and operational systems can be established from a reverse logistics perspective. At a tactical level the theory guides in determining activities to be performed in-house and those to be outsourced and why. At the operational level, the theory provides guidance in the organization of the human asset such that internal governance structures, match team attributes (Williamson, 1991).

Research in reverse logistics has focused on adoption levels, factors influencing adoption or implementation barriers. Empirical research has indicated adoption at lower than average level (Abdullah, Halim, Yaakub & Abdullah, 2011; Bouzon, Govindan & Rodriguez, 2018; Prakash & Barua, 2015; Yu, Tianshan & Din, 2018). According to Ho et al. (2012) key internal factors determining reverse logistics implementation were financial and human resources while external factors included cooperation with other firms. Abdulrahman, Gunasekaran and Subramanian (2014) categorized reverse logistics implementation obstacles as management, financial, policy and infrastructure related. Studies have also identified inadequate apprehension of reverse logistics and percipience that capital requirements for reverse logistics actualization as high to be the major implementation barriers (Huang & Yang, 2014; Prakash et al., 2015; Govindan & Bouzon 2018). Genchev et al. (2011) and Meyer et al. (2017) indicate that firm's ignore reverse logistics processes because they impose costs, hinder growth in productivity and impede competitiveness. Yet, according to Ravi and Shankar (2015) firms adopt reverse logistics practices to benefit from economic advantages associated with them.

Markley and Davis (2007) opine that reverse logistics could lead to gaining competitive advantage, but implementation is complex due to process challenges and uncertainties. Hung-Lau and Wang (2009) while investigating the applicability of reverse logistics models and theories, revealed lack of economic support and absence of a preferential tax policy as impediments to the reduction of investment costs of reverse logistics. Jim and Cheng (2006) concluded that the loss on material costs due to discarding returned goods is less than the resources spent on reverse logistics. These studies suggest reverse logistics has an association with advantageously creating competitiveness but with contrasting results. Similarly, previous studies discussed reverse logistics as a singular approach to the implementation of reverse flow systems instead of considering it as an intervention consisting of several approaches (He & Wang, 2005; Hung-Lau & Wang, 2009; Rao & Holt, 2005; Govindan et al., 2015; Yu et al., 2018). In this study it was found to be worth studying reverse logistics as an intervention consisting of outsourcing, collaborative enterprising, green strategies and product life cycle using the closed-loop supply chain approaches. Further studies prior have also considered studying reverse logistics as a sub-variable of an overall latent variable (Zhu, Sarkis & Lai, 2008; Ninlawan, Seksan, Tossapol & Pilada, 2010; Ochieng, Awino, Njihia & Iraki, 2016). In contrast Markley and Davis, (2007); Kumar and Putnam, (2008); Kwateng et al., (2014) posits that reverse logistics can be considered as an independent construct resulting in the creation of competitiveness. In view of the foregoing discussion the researcher propositioned that reverse logistics has no significant influence on a firm's competitive advantage.

RESEARCH METHODOLOGY

The study sought to deploy a correlation cross-sectional survey. Correlational research aims at indicating the direction, extent and nature of observed relationships (Zikmund, Babin, Carr & Griffin, 2013). Cross-sectional studies also allow for comparison among many variables in a study (O'Cass & Viet, 2007).

The population of this study consisted of all manufacturing firms in Kenya. The researcher established that KAM has the most comprehensive listing of manufacturing firms in Kenya. As at 30th June 2018 there were 903 firms registered as KAM members in the manufacturing sector. KAM membership was considered appropriate for this study because the association encourages members to have a reuse, reduce and recycling policy. The sample size was 340 manufacturing firms in Kenya after taking into account a non-response factor of 0.8 based on similar studies (Mellat-Parast & Spillan, 2014; O'Cass & Viet, 2007). Ho et al. (2012) used a sample of 300 in Hong Kong. The study sought to use proportionate stratified random sampling based on the manufacturing sub-sectors in the KAM directory and the number of firms in each sub-sector. Figure 1 below provides the path diagram for the relationship between reverse logistics and competitive advantage.

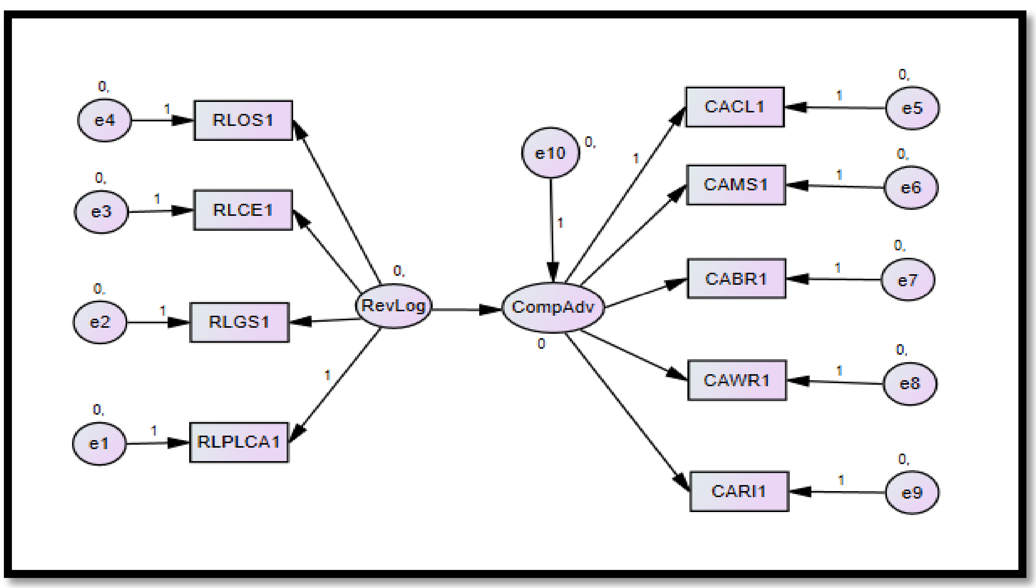

Figure 1. **Path Diagram linking Reverse Logistics and Competitive Advantage**

RESULTS

A total of 340 questionnaires were circulated to respondents out of which 151 were filled and returned. This represented a response rate of 44.4 %. Although high response rates (> 70%) are preferable Mugenda and Mugenda (1999) other studies have shown that results with response rates as low as 20% have no statistically significant difference with those of high response rates (Keeter, Kennedy, Dimock, Best & Craighill, 2006: Curtin, Presser & Singer, 2000). KMO and Bartlett tests were conducted using the latent constructs of reverse logistics and competitive advantage. The results reveal the KMO test value as 0.872 which is > 0.7. Bartlett's test gave a p-value of 0.000 which is < 0.05. Component matrix values ranged between 0.564 and 0.934. This meant that conducting confirmatory factor analysis will produce statistically reliable factors and results. It also meant that it is possible to conduct dimension reduction for both the measured and structured model with reverse logistics and competitive advantage as latent variables. Table 1 below provides details of the Cronbach's alpha measuring the internal reliability of the questionnaire items for reverse logistics.

Table 1

Cronbach Alpha Results for Reverse Logistics Questionnaire Items

	Variables	Cronbach Alpha
1	Outsourcing	0.708
2	Collaborative Enterprise	0.716
3	Green Strategies	0.729
4	Product Life Cycle Approach	0.707

Based on table 1 above the Cronbach alpha coefficient to check whether the questionnaire items were actually measuring the latent constructs for reverse logistics ranged between 0.708 and 0.729. This indicated sufficient internal consistency between the questionnaire items and the latent constructs they were measuring. Communalities were then assessed using principal component analysis in order to determine how much of the variance in each of the latent constructs for reverse logistics were explained by the undeleted questionnaire items (Field, 2013). The communality coefficient for the questionnaire items measuring the latent constructs for reverse logistics range from 0.307 to 0.889. Since these values were > 0.3 it indicates that questionnaire items have sufficient explanatory power on the latent constructs Pallant, 2007). Before further statistical analysis convergent and discriminant validity tests were conducted on the latent constructs model linking reverse logistics with competitive advantage as shownin figure 2 below.

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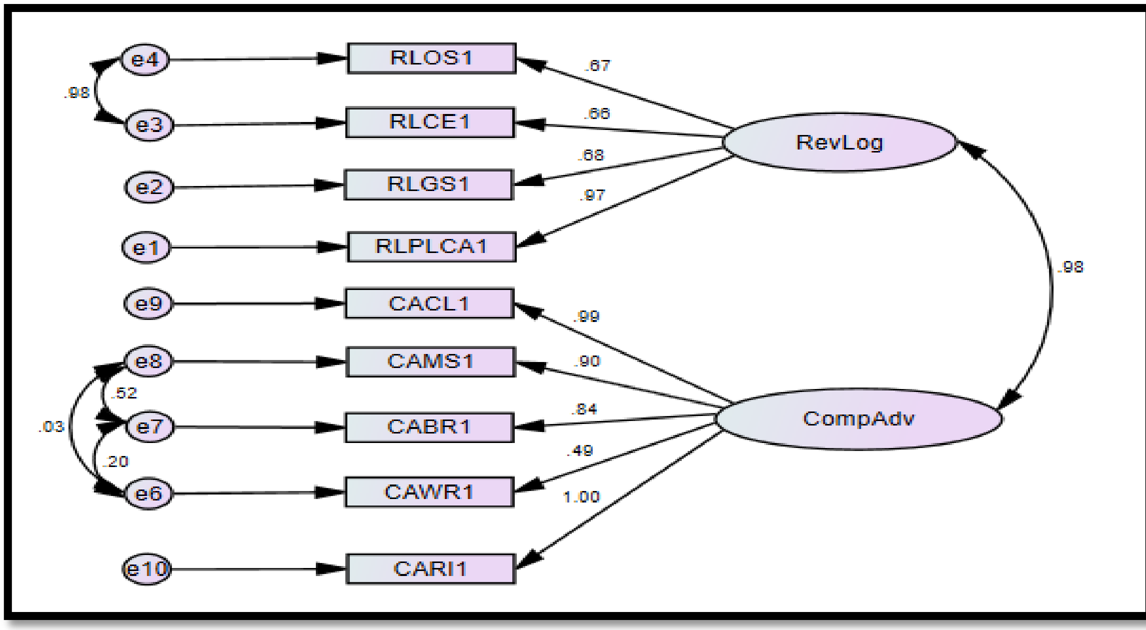

Figure 2. Convergent Validity Test linking Reverse Logistics and Competitive Advantage

Based on figure 2 above the standardized factor loadings for all the latent constructs of reverse logistics were > 0.5. The standardized factor loadings for each of the latent constructs of competitive advantage were > 0.5 except for the construct CAWR1 with a factor loading of 0.49. This was therefore deleted from the model.

These standardized factor loadings suggest that we have acceptable levels of convergent validity. Convergent validity was also checked using AVE. Table 2 below reveals the AVE for the latent constructs showing the association linking reverse logistics with competitive advantage.

Table 2: ***Average Variance Extraction results for Reverse Logistics and Competitive Advantage***

Factor	<---	Component	Loadings	Squared Loadings	AVE
RLPLCA1	<---	RevLog	0.967	0.935	0.569
RLGS1	<---	RevLog	0.681	0.464	
RLCE1	<---	RevLog	0.658	0.433	
RLOS1	<---	RevLog	0.667	0.445	
CABR1	<---	CompAdv	0.837	0.701	0.875
CAMS1	<---	CompAdv	0.901	0.812	
CACL1	<---	CompAdv	0.992	0.984	

CARI1	<---	CompAdv	1.002	1.004

Since the AVE values for the association of reverse logistics with competitive advantage are > 0.5, these indicate good convergent validity. Discriminant validity which examines how constructs perceived not to be theoretically associated are indeed not associated was measured by comparing the AVE with the MSV. Table 3 below summarizes the MSV squared loadings for the reverse logistics association with competitive advantage latent variable.

Table 3

Maximum Shared Variance results for Reverse Logistics and Competitive Advantage

Component	**<-->**	Component	Loadings	Squared Loadings
RevLog	<-->	CompAdv	0.657	0.431

Based on table 3 above the square correlation for the interaction of reverse logistics with competitive advantage latent variables was 0.431. From table 4.14 the AVE for reverse logistics and competitive advantage were 0.569 and 0.748 respectively. This shows that the square correlation was < the AVE of reverse logistics and competitive advantage latent variables. This suggests discriminant validity among the latent constructs. In measuring reverse logistics, four latent constructs namely; outsourcing, collaborative enterprise, green strategies and product life cycle were used.

Each of the latent constructs forming the reverse logistics variable were aggregated and coefficients that summarize the aggregated data set were calculated. Outsourcing was rated as the most common reverse logistics approach among Kenyan manufacturing firms with a mean of 3.63 (Std.Dev = 0.51). The second most common reverse logistics approach was green strategies with a mean of 3.56 (Std.Dev = 0.41). The least rated were product life cycle approach and collaborative enterprise both with means of 3.51 (Std.Dev = 0.58 and 0.60 respectively). These generally indicate that the respondents generally concurred with the statements moderately but tending towards a large degree. The z-skewness scores were between -0.06 and 0.11. This generally reflects that the distributions generated from these latent constructs tended to be symmetrical. The z-kurtosis scores were between -1.56 and -0.78. Although this suggests the distributions formed by these latent constructs were mesokurtic but they were tending towards being platykurtic.

Competitive advantage was measured using four constructs namely; customer loyalty, market share, brand recognition and revenue increase. Customer loyalty was measured using the customer retention rate. Market share was measured using the market share index for each firm in each industry. Brand recognition was measured using the profit margin as a proxy indicator. Revenue increase was measured by subtracting the revenue for last from those of the previous year and dividing this with the revenue for the previous year to determine the percentage increase. On average the customer retention rate was 91.66% (CV = 3.2%). The mean market share for the manufacturing firms was 17.52% (CV = 20.6%). On average the profit margin for the manufacturing firms was 26.97% (CV = 25.7%) and the average revenue increase for the manufacturing firms was 6.43% (CV = 31.6%). The four constructs used to measure competitive advantage had z-skewness scores ranging between -0.23 and 0.01 indicating symmetrical distributions. Z-kurtosis scores ranged from -1.89 to -1.32. These z-kurtosis scores range between ± 1.96 indicating that the distributions are mesokurtic but tended towards being platykurtic.

Kolmogorov-Smirnov test and Shapiro-Wilk test were used for testing of normality (Field, 2013). The results of the Kolmogorov-Smirnov for all the 8 key constructs of the study show significance levels with the lowest at 0.058 and the highest > 0.200. While the Shapiro-Wilk test results for all the 8 key variables show significance levels ranging from 0.069 to 0.348. Since the p-values are > 0.05 then the distributions generated by the observations for each variable have a normal distribution. Durbin-Watson test statistic (D) was used to test for autocorrelation of the first order. Results showed the Durbin-Watson calculated statistics values ranged from 1.848 to 1.949 (Gujarati, 2003). These were all within the acceptance region of 1.788 to 2.212 meaning that serial autocorrelation does not exist at the first order level. The VIF values for the latent constructs of reverse logistics and operational performance were between 1.082 and 5.148. The corresponding tolerance values ranged between 0.194 to 0.954. Although some of the VIF co-efficients were > 5, they were not significantly > 5 indicating the latent were not multicollinearily associated (Tabachnick & Fidell, 2013). The Koenker calculated test statistics value ranged from 0.062 to 0.356. Because these p-values were > 0.05 then the variance of the outcome variable given the predictor variables was presumed to be constant and therefore homoscedasticity was assumed (Hair et al., 2014).

The overall model fit of the measured models was assessed through the absolute, incremental and parsimonious model fitness tests. Absolute fitness was assessed using chi-square value, p-value, RMSEA and GFI where the chi-square value was expected to be small, p-value > 0.05, RMSEA < 0.80 and GFI > 0.90. Incremental model fitness was assessed using AGFI, CFI, NFI and TLI. For a good incremental fit, AGFI > 0.90, CFI > 0.90, 0.8 < NFI < 1.00 and TLI > 0.9. Parsimonious model fitness was assessed using CMIN/DF. For a good parsimonious fit the minimum discrepancy ratio is expected to be < 5. Table 4 below summarizes the results of the confirmatory factor analysis for the measured model for the latent constructs of reverse logistics and competitive advantage.

Table 4: ***Overall Model Fit Results for the Measured Model***

Test	Decision Criteria	Model Result	
		RevLog	**CompAdv**
Chi-Square		0.319	0.122
Degrees of Freedom		1	1
p-value	> 0.05	0.572	0.727
GFI	> 0.90	0.999	1.000
CFI	> 0.90	1.000	1.000
AGFI	> 0.90	0.989	0.996
NFI	0.8 < NFI < 1.00	1.000	1.000
TLI	> 0.90	1.003	1.005
RMSEA	< 0.08	0.000	0.000
CMIN/DF	< 5	0.319	0.122

From the results chi-square value ranged between 5.050 and 0.122 indicating they were small. P-value ranged between 0.08 and 0.881 showing that they were > 0.05. RMSEA < values for the latent constructs of reverse logistics and competitive advantage were > 0.08. GFI values ranged between 0.983 and 1.000 indicating they were > 0.90. These suggest that the measured models had good absolute fit. Incremental model fitness was assessed using AGFI, CFI, NFI and TLI. AGFI values ranged between 0.916 and 0.996. These were all > 0.90. CFI values were between 0.995 and 1.000 indicating they were all > 0.90. The NFI values ranged between 0.993 and 1.000 showing they were between the threshold values, 0.8 < NFI < 1.00. TLI values were ranging between 0.986 and 1.005 showing they were > 0.9. These values indicate that all the measured models for the latent constructs had good incremental fit. CMIN/DF values ranged between 0.122 and 2.525. The minimum discrepancy ratio was expected to be < 5. These indicated that measured models for the latent constructs had good parsimonious fit. CFA was performed for the structured model using chi-square value, RMSEA, GFI, AGFI, CFI, NFI, TLI and CMIN/DF. Table 5 below summarizes the results of the CFA for the interaction of reverse logistics with competitive advantage.

Table 5: ***Overall Model Fit results for the Structured Model***

Test	Decision Criteria	Model Result
Chi-Square		49.099
Degrees of Freedom		16
GFI	> 0.90	0.929
CFI	> 0.90	0.989
AGFI	> 0.90	0.841
NFI	0.8 < NFI < 1.00	0.983
TLI	> 0.90	0.980
RMSEA	< 0.80	0.117
CMIN/DF	< 5	3.069

Table 5 above reveals chi-square value as 49.099 which was considered to be fairly small given that the number of degrees of freedom (16). RMSEA was 0.117 which is > 0.08 but not significantly larger. The GFI of 0.929 was > 0.90. These suggest that the model had a fairly good absolute fit. From table 4.42 above, AGFI, CFI, NFI and TLI had coefficients of 0.841, 0.989, 0.983 and 0.980. NFI was within the range between 0.80 and 1.00. CFI and TLI were > 0.9. Although the AGFI was low (0.841) it was tending towards the threshold of 0.9. These indicate the model had a fairly good incremental fit. Table 5 indicates a CMIN/DF of 3.069 which was < 5 suggesting a good parsimonious fit. Generally the model had good overall fit. Figure 3 below reveals the unstandardized structural equation model for the reverse logistics interaction with competitive advantage.

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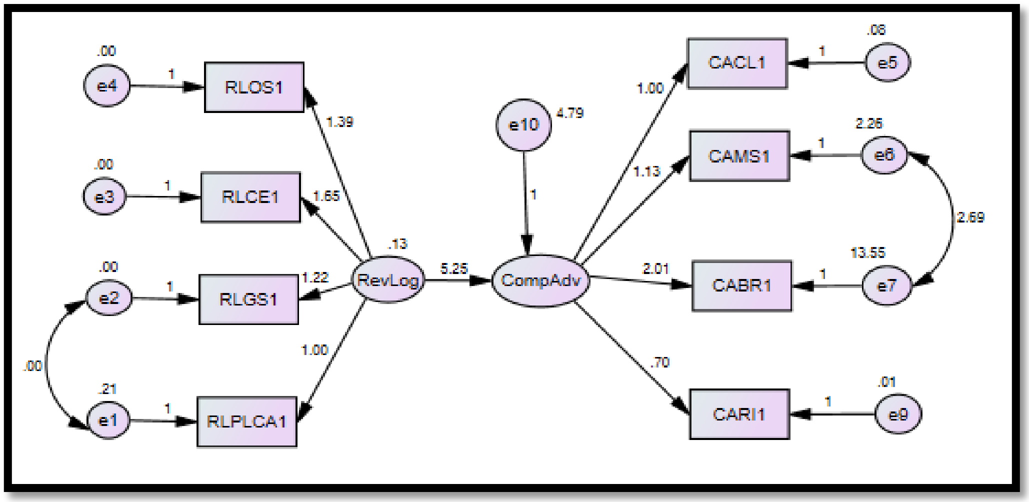

Figure 3. Unstandardized Structural Equation Model linking Reverse Logistics and Competitive Advantage.

An assessment of whether the unstandardized factor loadings were statistically significant was then performed. The critical ratios were all > 1.96 with p-values < 0.05, indicating that the factor loadings are statistically significant. This means that the latent constructs of the measured models have a statistically significant relationship. The standardized factor loadings range from 0.632 to 0.999. This meant that the factors were loading very highly on the components. Finally an assessment of whether the latent variables have a statistically significant relationship was done by calculating the standard error of the estimates, the critical ration and p-values. The critical value was again > 1.96 and the p-values was < 0.05 indicating that the factor loadings are statistically significant. This means that the latent variables of the structured model had a statistically significant relationship. Figure 4 below summarizes the standardized factor loadings for the measured and structured relationships between reverse logistics and competitive advantage.

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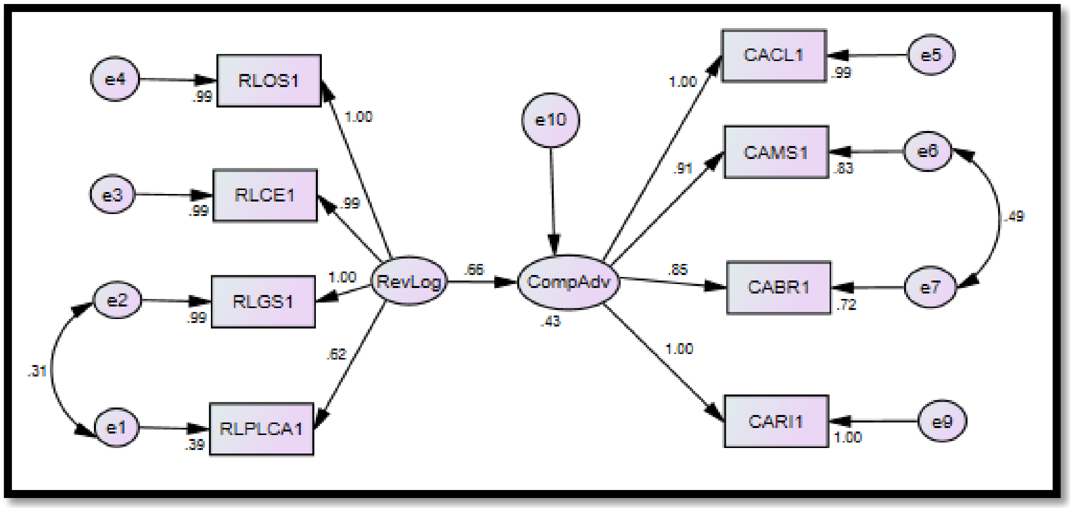

Figure 4. Standardized Factor Loadings for the Measured and Structured Model linking Reverse Logistics and Competitive Advantage.

Figure 4 also indicates the standardized factor loading for the latent variables reverse logistics and competitive advantage was 0.66. Since this is > 0.5 it indicated a strong association linking the latent variables. Common Method Variance (CMV) was assessed to determine whether it was necessary to include the common method latent variable while performing hypothesis test. The CLF for each of the variables was - 0.03. This therefore gives a common method variance of 0.0009 which is < 0.5 for each of the variables. The difference between the standardized regression weights without the CLF and with CLF were < 0.20 again indicating the model is not affected by spurious correlations. Therefore it will not be necessary to include the common method latent variable while performing the hypothesis test. The unstandardized structural equation model for reverse logistics interaction with competitive advantage had a path co-efficient of 5.25 meaning that for every unit increase in reverse logistics initiatives competitive advantage improves by a factor of 5.25. The p-value for reverse logistics interaction with competitive advantage was < 0.001 hence the null hypothesis was rejected and the study therefore showed reverse logistics had a significant and positive influence on a firm's competitive advantage.

CONCLUSIONS

The research findings clearly demonstrate that reverse logistics has an influence on competitive advantage. This provides additional empirical evidence supporting Transaction Cost Theory. The results of the study auger well with the assertion that while trying to improve a firm's competences through the implementation of reverse logistics, firms should also pursue transaction cost optimizing behavior. Such a balance results in gaining competitive advantage (Clemons & Row, 1992).

The results of the research partially agreed with prior studies that implementation of reverse logistics leads to competitive benefits in the form of increased customer loyalty, increased market share, improved brand recognition and an increase in revenues (Glenn-Richey et al., 2005; Jim & Cheng, 2006; Jayaraman & Luo, 2007). Further, reverse logistics programmes while creating competitiveness also need to preserve and conserve the environment in today's competitive markets (Markley & Davis, 2007; Kumar & Putnam, 2008; Kwateng et al., 2014).

This study recognized that competitive advantage can be gained by implementing reverse logistics holistically. Therefore manufacturing firms should implement reverse logistics as an integrated intervention consisting of outsourcing, collaborative enterprising, green strategies and closed-loop supply chain approaches (Govindan et al., 2015; Yu et al., 2018). By doing so, they will contribute to environmental conservation apart from gaining market share, customer satisfaction, brand recognition and an increase in revenues.

IMPLICATIONS

The study adds empirical evidence to the interaction between reverse logistics and competitive advantage. Specifically, the study demonstrates that competitive advantage is created by implementing reverse logistics using outsourcing, collaborative enterprising, green strategies and closed-loop supply chain approaches. This is reflective of the ideas discussed by Tan and Mohamad-Zailani (2016), Hung-Lau and Wang (2009), Rao and Holt (2005) and Govindan et al. (2015) respectively.

The study offers empirical evidence on the importance of considering reverse logistics as an integrated approach (He & Wang, 2005; Hung-Lau & Wang, 2009). A more in-depth analysis can explore the different approaches to the implementation of reverse logistics. Additional strategies or approaches could also provide more explanations on the nature of causation of the independent variable on the other study variables.

The study obligates policy developers in the manufacturing sector, to make policies that leverage the influence of reverse logistics on competitive advantage. These should promote outsourcing reverse logistics to return's service providers He and Wang (2005), formation of industry associations or strategic alliances to facilitate reverse logistics activities He and Ji (2006), adoption of reuse, recycle and remanufacture policies Rogers and Tibben-Lembke (2001) and developing closed-loop supply chains (Chapman & Corso, 2005).

Increased attention of research in the service sector requires future research to aim at generalizing the results beyond the context of manufacturing. This research could also be replicated in other industries or countries with different cultural backgrounds. Similarly intra-industry or intra-sectoral comparison of results could also be undertaken as a research stream. These would require larger samples per industry or sector.

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