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Sustainable Operations Management Practices and Competitive Advantage of Manufacturing Firms in Kenya

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Abstract

Sustainable Operations Management refers to strategies, actions, and techniques that support operational policies in achieving environmental and economic objectives. This paper focuses on examining the effect of Sustainable Operations Management Practices on the competitive advantage of manufacturing firms in Kenya. Despite the importance of green innovation to green issues and success in the business, a review of studies revealed limited information in connection to the strategic role played by sustainable operations technologies. This paper adopted a positivist philosophy to the development of knowledge and used a cross-sectional survey research design. The population sample consisted of 903 manufacturing firms registered with the Kenya Association of Manufacturers. A sample size of 277 was calculated using Slovin's formula, and a sample of 300 was used to cater for non-response. Primary data was collected. Validity and reliability were also tested and finally, data was analyzed using covariance-based Structural Equation Modeling (SEM). The results showed that Sustainable Operations Management Practices have a significant influence on a firm's competitive advantage. The main conclusion was that Sustainable Operations Management Practices lead to minimized operating costs, enhanced satisfaction of employees, and environmental improvement leading to competitive advantage. The paper recommends the implementation of Sustainable Operations Management Practices by manufacturing firms since it comes with some advantages. The findings of the paper are relevant to the advancement of environmental policy and practices. It also adds knowledge by providing theoretical underpinning, conceptual and methodological references.

Keywords: Sustainable operations management practices, competitive advantage.

Introduction

Numerous resources remain inadequate and semi-renewable while the ecosystem's ability in the absorption of contaminants is constrained. Human consumption of natural resources is unsustainable, leading to major environmental challenges. Climate change, resource exhaustion, and pollution have a significant impact on the ecosystem (Kleindorfer, 2010). Manufacturing firms have been associated with negative environmental impact due to the rising mindfulness of environmental challenges caused by their operations (Galdeano, Ce´spedes & Martı´nez, 2008). Therefore, they have to embrace technologies that utilize alternative energy sources and minimize pollution by implementing Sustainable Operations Management Practices (Meadows, Randers & Meadows, 2004). The Sustainable Operations Management Practices can be defined as environmental initiatives taken to care for the environment, improve life, and for economic gains (Abdul-Rashid, Sakundarini, Ghazilla & Thurasamy, 2017).

This paper was grounded on various theories; Theory of Performance Frontiers (TPF), Open System Theory (OST), and Natural Resource-Based View (NRBV). The TPF states that unique operating practices such as Sustainable Operations Management Practices give a firm a more competitive advantage than the asset frontier (Schmenner & Swink, 1998). The OST confirms the interdependence between the environment and the organization. The organization takes care of the environment by adopting Sustainable Operations Management Practices leading to competitive advantage (Ashmos & Huber, 1987). The NRBV argues that the competitive advantage of a firm can be achieved by employing Sustainable Operations Management Practices which require tacit skills that are hard to observe and copy (Hart & Dowell, 2011). Hence, these theories are important because they cover an important aspect of this paper and also increase understanding.

Manufacturing remains an important pillar of the government's employment creation strategy. It contributes to revenue and is a source of tradable goods (World Bank, 2014). The Kenyan government has identified it as one of its big four agenda for growth and employment creation. It is among the sectors selected to aid in the attainment of a sustainable annual Gross Domestic Product (GDP) growth of 10 percent (Vision 2030, 2008). Manufacturing activities consume considerable amounts of resources that are non-renewable and are energy-intensive, leading to negative environmental challenges including acid rain, global warming, poisoning of the biosphere, and climatic change in addition to raising concerns regarding depletion of natural resources (International Energy Agency, 2009).

Despite the current efforts, sustainable efforts are yet to merge into the mainstream of operations research (Gavronski, Paiva, Teixeira & de Andrade, 2013). The company's operations decisions form part of the key contributors to the anthropogenic impact on the ecosystem. If appropriately addressed, Sustainable Operations Management Practices have the likelihood of becoming crucial to competitive advantage and a solution to the problems experienced. This is because distribution and manufacturing constitute a vast section of human activity (Gonzaléz, Perera & Correa, 2003). Sustainability calls for Sustainable Operations Management Practices because of the central position of companies in the world economy (Esty & Winston, 2009).

Research Problem

The company's operations management decisions form part of the key contributors to the anthropogenic impact on the ecosystem. Therefore, Sustainable Operations Management Practices potentially play a critical role in the contribution of solutions for challenges faced by humanity. Despite its importance and ongoing efforts, it has not fused into the mainstream of operations management research as studies in the area of Sustainable Operations Management Practices are limited (Gavronski, Paiva, Teixeira & de Andrade, 2013). There are also concerns about whether the implementation of sustainable practices will attain a competitive advantage. However, various studies have established a positive connection (Bennett, Nunes & Shaw, 2013; Drake & Spinler, 2013). Wagner (2005) identified a relatively weak positive link, while Watson, Klingenberg, Polito, and Geurts (2004) did not identify any link. Therefore, a paper to help resolve these inconsistencies is required.

Manufacturing activities are connected to negative environmental challenges like pollution, climatic change, and depletion of natural resources (International Energy Agency, 2009). The Government of Kenya has identified manufacturing as one of its big four-agenda. However, its advancement has been sluggish in the previous years, which is attributed to adverse weather conditions, high production costs, and competition. The ban on plastic bags also had adverse effects on the volume of output of the sector (Kenya National Bureau of Statistics (KNBS), 2018). This clearly shows that a solution is required to resolve these problems.

In the operationalization of Sustainable Operations Management Practices, some researchers (Abdul-Rashid et al., 2017; Drake & Spinler, 2013) used few indicators (product design, manufacturing process, supply chain, and end-of-life management), which did not take into consideration product life cycle as a whole. The Sustainable Operations Management

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Practices incorporate all aspects of operations within and beyond the firm to obtain maximum possible benefits (Hill, 2007). Most of the studies reviewed are limited to the developed economies (US, Malaysia, UK and India). African countries face major environmental challenges (International Labour Organization, 2012). Hence, a clear understanding and sufficient knowledge will facilitate the implementation and problem-solving process. Previous studies done in Kenya covered the area of green manufacturing and Green Supply Chain Management (GSCM). For example, Odock, Awino, Njihia, and Iraki (2016) did a study on the effect of GSCM practices on the performance of the International Organization for Standardization (ISO) 14001 certified manufacturing firms in East Africa. Mwaura, Letting, Ithinji, and Orwa (2016) examined green distribution practices and their impact on the competitiveness of food manufacturing firms in Kenya. These studies were on some of the facets of Sustainable Operations Management Practices. However, a study that considers all the facets of Sustainable Operations Management Practices is important.

In methodology, Mwaura, Letting, Ithinji, and Orwa (2016) used linear regression analysis while Adebambo, Ashari, and Nordin (2015) used Partial Least Squares Structural Equation Modeling (PLS-SEM). This paper used Covariance Based Structural Equation Modeling (CB-SEM). This is because it allows for more sophisticated and comprehensive analysis (Hair et al., 2010). Thomas, Fugate, Robinson, and Tasçioglu (2016) carried out a behavioral experimental research which is prone to human error and environmental influence. This paper adopted a cross-sectional survey to avoid these shortcomings. More research is necessary to take care of the knowledge gaps. This paper aims at addressing the gaps by posing the following question: What is the effect of Sustainable Operations Management Practices on a firm’s competitive advantage?

Objective

The objective of this paper is to determine the relationship between Sustainable Operations Management Practices and competitive advantage.

Literature Review

Sustainability is the capability for the achievement of environmental, social, as well as an economic dimension in the current time, without any compromise on the ability to maintain the same in the future (Brundtland, 1987). Sustainable Operations Management is the quest for social, economic, and environmental objectives within and beyond firms’ operations (Krajnc & Glavič, 2005). In the past, variations in climate were mainly connected to natural processes, but currently, the changes are largely attributed to anthropogenic causes of manufacturing firms. Companies should not only be concerned about their operations in business but also for establishing good environmental behavior by adopting Sustainable Operations Management Practices (Ashby, Leat & Hudson-Smith, 2012). Some researchers have attempted to identify and classify the varied Sustainable Operations Management Practices as eco-design, sustainable buildings, green production, ecological supply chains, corporate social responsibility, and reverse logistics (Abdul-Rashid et al., 2017; Bennett, Nunes & Shaw, 2013; Drake & Spinler, 2013). To capture the whole product life cycle from when the operations cycle commences, this paper adopted a significant set of indicators which include sustainable product design and development, sustainable material use, sustainable manufacturing process, sustainable distribution, sustainable product use, and sustainable end-of-life.

Designing a product constitutes a vital stage that determines the behavior of the product in the later stages. Sustainable product design and development is aimed at decreasing or eradicating harmful substances, minimizing wastes, improving resource recovery, preservation and efficiency, designing for reuse and remanufacturing, as well as adding to the sustainability aspects (Duflou et al., 2012; Lee, Lye & Khoo, 2001). In material sourcing, a manufacturer should make use of renewable or recycled materials, and should make sure that the materials are not likely to cause any harm to the ecosystem (Blus, 2008). Sustainable material use involves an assortment of materials that are of low energy content and impact, not hazardous, recyclable, and recycled materials and non-exhaustible supplies. It also entails weight and volume reduction and the use of replenishable (Brezet & Hemel, 1997). Manufacturing processes should be developed in such a way that they encourage energy reduction; resource utilization; and the reduction of air emissions, liquid, solid, and gaseous wastes (Jorgensen et al., 2007). The sustainable manufacturing process includes production techniques optimization and alternatives, waste reduction, use of low/clean energy, and few/clean production processes (Singhal, 2013). Sustainable distribution ensures that there is efficient product transportation from the manufacturers to the final user. It is also about product specifics like packaging, transportation mode, and logistics operations.

From the viewpoint of the environment, the use phase leads to the most adverse effects in products using energy as well as consumables (Singhal, 2013). Sustainable product use consists of reduction of the environmental impact, few/clean consumables, consumption of low/clean energy, no energy/auxiliary material use, use of the least harmful source of energy, and renewable energy sources (Van Hemel, 1995). Sustainable end-of-life practices intend to restore components/materials in the last stage of the life cycle of a product through re-manufacturing, reuse, and recycling to maintain its worth after it has been used (Smith & Ball, 2012). This entails

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optimizing the end-of-life system, material, and product recycling as well as clean incineration. Its purpose is to ensure the reuse of the product's valuable components as well as proper waste management (Brezet & Hemel, 1997).

A firm is considered as having a competitive advantage by having adopted a unique strategy of creating value not used by rival firms (Barney, 1991). Basically, there are two types of competitive advantage; low cost and differentiation (Porter, 1985). A competitive advantage exists where a firm has the capability of delivering similar benefits at a lower cost than those offered by rival firms (cost advantage). It can also exist where the firm delivers benefits that surpass those of rival products (differentiation advantage) (Ranko, Berislav & Antun, 2008). As stated by Pearce and Robinson (2011), differentiation seeks to build a competitive advantage based on features and performance, and it allows for premium prices. The strategy is established around numerous features including quality of the product, technology, innovativeness, customer service, design feature, reputation, dependability, durability, and brand image (Moses, 2010). Organizations that attain success in cost leadership carry out critical value chain activities at less cost compared to their rivals. Oftentimes, they possess skills for the development of commodities for efficient production; increased level of experience engineering of the manufacturing process; large scale as well as efficient supply chain; the vigorous quest of cost reductions; minimized operations time; tight cost control and efficiency; high capacity utilization and technological advantages (Wang, Lin & Chu, 2011).

The Sustainable Operations Management Practices can develop to be an essential competitive edge because the continued existence and competitiveness of organizations are dependent on their practices as well as capabilities for adapting the external environment. Hence, this is attributable to variation in customer preferences, government regulations, technology as well as competitors (Machuca, Jiménez, & Garrido-Vega, 2011). The Sustainable Operations Management Practices have emerged as a new competitive requirement as efforts for minimizing environmental, economic as well as social effects lead to minimized operating costs, enhanced satisfaction of employees, and environmental improvement through product marketing leading to competitive advantage (Shahbazpour & Seidel, 2006). The relationship is grounded on NRBV, OST, and TPF theories.

The link between Sustainable Operations Management Practices and competitive advantage has been studied by various authors who found a positive link. For example, Bennett, Nunes, and Shaw (2013) did a study on how a strategy of sustainable operations can develop a firm's competitive advantage to address strategies for sustainable operations when aiming at increasing profitability. It was primarily a qualitative case study on operations strategy, and it may limit generalization since it was a case study.

Drake and Spinler (2013) did a study on Sustainable Operations Management to establish the drivers underlying sustainability and how an operations management lens contributes to it. It employed a qualitative research design, but the study did not consider the TBL approach and it ignored the whole product life cycle. While the above studies suggest that environmental consciousness can help firms improve their competitive advantage, others have questioned the confidence of environmental advocates (Wagner, 2005; Watson, Klingenberg, Polito & Geurts, 2004). Consequently, the relationship represents a perplexing issue in the literature. As stated above, there are limited studies that are specifically on Sustainable Operations Management Practices. Hence, this paper contributes to scarce empirical evidence. It will employ the TBL approach covering the whole product life cycle. It posits that the implementation of Sustainable Operations Management Practices leads to a competitive advantage.

Conceptual Framework

Figure 1 below shows the relationship between Sustainable Operations Management Practices (product design and development, material use, manufacturing process, distribution, product use, end-of-life) and competitive advantage (cost and differentiation advantage). The null hypothesis shows that Sustainable Operations Management Practices have no significant influence on the firm's competitive advantage.

Independent Variable Dependent Variable

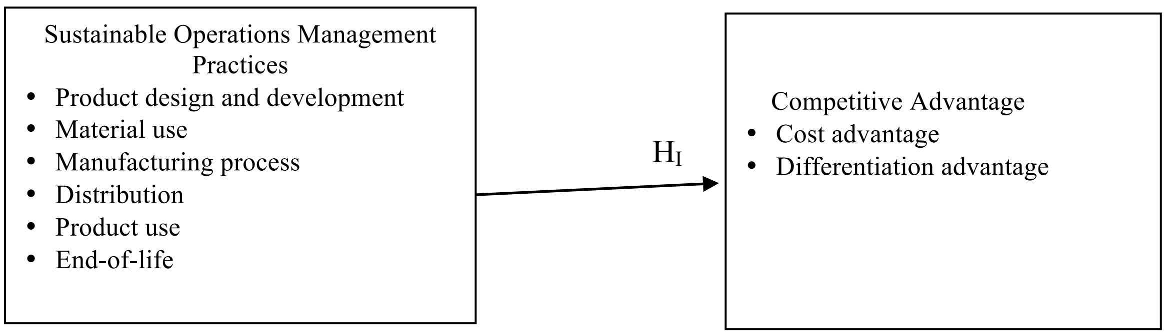

Figure 1. Conceptual Framework

Research Methodology

The paper adopted positivist philosophy to the development of knowledge. This is because the philosophy makes consideration of reality in an objective way such that facts remain real and the person conducting the study is detached making a person an objective observer of the research

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issue, thus minimizing bias. A cross-sectional survey design was used, which is suitable when the main goal is to find out whether substantial relationships amongst variables are in existence at any point over time and where data was gathered at a point in time across various firms (Cooper, Schindler & Sun, 2013). The population consisted of all manufacturing firms in Kenya, where the focus was on manufacturing firms registered with the Kenya Association of Manufacturers. This was so because these firms are perceived to be large and have been in existence for some time. As a result, they have accumulated enough resources to enable them implement Sustainable Operations Management Practices. The Sustainable Operations Management Practices require long-term investment, enough resources to implement and firm commitment, while the majority of firms do not implement them early enough (Hart, 1995).

The Kenya Association of Manufacturers' entities are categorized into 14 sectors: 13 of which deal with processing and value addition while the remaining one is under service and consultancy. The paper targeted 903 manufacturing firms under the 13 sectors, which deal with processing and value addition (Kenya Association of Manufacturers, 2018). The population was first stratified into 13 sectors with the nature of raw materials enterprises import or the products they produce. Then Slovin's formula (1960) was adopted to compute the sample size. The formula is most suitable when nothing is known about the population behavior, and it was successfully used by Sugandi (2014) when developing a model of environmental conservation.

Slovin's formula

$$n = \frac{N}{1 + Ne^2}$$

Where n is the size of the sample, N is the size of the population, and e is the desired margin of error. The paper used a 95 percent confidence level. Therefore:

$$n = \frac{903}{1 + 903(0.05)^2} = 277$$

However, 300 firms were surveyed to cater for non-responses.

Primary data was utilized and it was gathered using a designed questionnaire by way of 'drop and pick later' method. Kaiser-Meyer-Olkin (KMO) and Bartlett's test of sphericity were first carried out for all constructs to examine the appropriateness of factor analysis. For sampling adequacy, Kaiser (1974) suggests a value more than 0.5 while for Bartlett's test the significance value must be less than 0.05 (Bartlett, 1950) for factor analysis to be useful. Diagnostic, reliability, and validity tests were also conducted and the data was analyzed using CB-SEM. The SEM is appropriate for investigating complex associations and entails the simultaneous examination of multiple variables as well as their connection (Astrachan, Patel & Wanzenreid, 2014). A perfect model include absolute fit (x^2 significance = p > 0.05, Root Mean Square Error Approximation (RMSEA) < 0.08, Goodness-of-Fit Index (GFI) > 0.90); incremental fit (Adjusted Goodness-of-Fit Index (AGFI) > 0.90, Normed Fit Index (NFI) > 0.90, Comparative Fit Index (CFI) > 0.90, Tucker Lewis Index (TLI) > 0.90); and parsimonious fit (x^2/degrees of freedom < 3.0). Although the threshold value of the fit indices is 0.9, a value of 0.8 and above is acceptable (Baumgartner & Homburg, 1996; Doll, Xia & Torkzadeh, 1994).

Results and Discussion

All KMO measures were within the required values, showing that all latent constructs were above the 0.5 thresholds (Kaiser, 1974). Bartlett's test of sphericity revealed that all the latent constructs had Chi-square values (p-value = 0.000) that were significant at a level of less than 0.05 (Bartlett, 1950). These two tests implied that factor analysis was relevant. Factor loadings were all within the acceptable range, while Cronbach's alpha was in line with the 0.7 coefficient adopted by the paper which is favorable. The range of item-total correlation was above the threshold total correlation of 0.3. Hence, the reliability and construct validity were confirmed.

For linearity, the coefficient of determination (R^2) was 0.3483. This meant that Sustainable Operations Management Practices accounted for 34.83 percent of the variance in competitive advantage. Hence, this showed that the portion of the variance in competitive advantage accounted for by Sustainable Operations Management Practices was moderate (Wong 2013). The correlation coefficient (r) was 0.590 which was above 0.3, and this indicated that the relationship between Sustainable Operations Management Practices and competitive advantage was positive and moderately strong. The Shapiro-Wilk test p-values were all more than 0.05; skewness values were all below 1.0; and all the critical regions for the kurtosis did not exceed 3.0. Hence, the data were normally distributed. The Variance Inflation Factor (VIF) values ranged from 1.6 to 2.5 which was below the threshold of 10. All the tolerance values were less than 1, indicating no multicollinearity. Correlation coefficient values ranged from 0.378 to 0.683 which were all below 0.8, signifying that multicollinearity was not a problem. The p-value as indicated by the Koenker test was 0.596 which was more than 0.05. Hence, null hypothesis that heteroskedasticity was not present was not rejected. The pattern of dots in the scatter plot was also not systematic, but was rectangular which showed homoscedasticity.

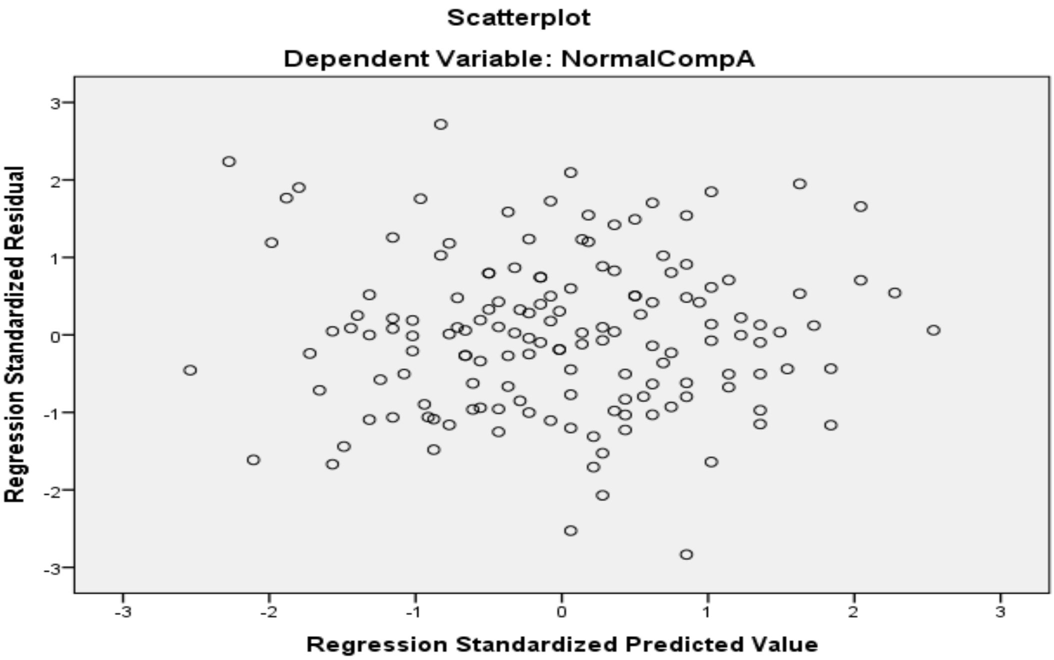

Figure 2. Standardized Predicted Values versus Standardized Residuals
Source: Research Data 2020

Analysis of a Moment Structures (AMOS) was employed to carry out Confirmatory Factor Analysis (CFA) to validate the measurement model and to establish acceptable goodness of fit levels. Using the formula put forward by Hair, Black, Babin and Anderson (2010), each factors' Average Variance Extracted (AVE) was computed for all the constructs using:

$$AVE = \sum_{i=1}^{n} \lambda_i^2 / n \qquad (1)$$

Where AVE is the average variance extract, λ_i is standardized factor loading, and n is the number of items.

The factor loadings were all more than the acceptable level of 0.60 and ranged from 0.64 to 0.93. Hence, convergent validity was verified. All AVE were greater than 0.5 and factor loadings were greater than 0.7. To establish convergent validity, each latent variable's AVE should be at least 0.5 or higher (Hair, Black, Babin & Anderson, 2010). For all the constructs, all item's standardized loadings were above the ideal level. Hence, this results in the confirmation of convergent validity. The formula for calculating composite reliability as recommended by Hair et al. (2010) is given as follows:

$$CR = (\sum\lambda_i)^2/[(\sum\lambda_i)^2 + \sum(\delta_i)] \quad (2)$$

Where CR is composite reliability, λi is standardized factor loading, and $\boldsymbol{\delta}_i$ is indicators measurement error.

All composite reliabilities of construct had a value ranging from 0.66 to 0.91, indicating adequate internal consistency. The reliability value is required to be more than 0.70. However, if the other indicators of the construct's validity are good, values ranging from 0.60 to 0.70 are also deemed acceptable (Hair, Black, Babin & Anderson, 2010). All composite reliability of the five latent constructs had a value greater than 0.7, indicating a good internal consistency. The AVE of individual factors and their shared variances were compared to examine discriminant validity (Fornell & Larcker, 1981). The AVE values ranged from 0.71 to 0.91, where the lowest AVE value was 0.71 which exceeded the largest squared correlation 0.63. This output indicated that the variance shared among factors was lower than that of individual factors. Hence, discriminant validity was confirmed.

The full structural equation model was taken into account and all the paths reflect literature findings. Thus, Figure 3 below shows the graphical outlay of SEM. As shown in Figure 3, when Sustainable Operations Management Practices increased by one standard deviation, the competitive advantage increased by 0.60 standard deviations. Squared multiple correlations (R^2) indicated that Sustainable Operations Management Practices accounted for 0.36 variance in competitive advantage. There were 10 unobserved and 16 observed variables. The model was recursive with a sample size of 150 and variables were 51, 16 observed, 35 unobserved, 26 exogenous, and 25 endogenous. Also, Table 1 below shows degrees of freedom of 93. There were 136 distinct sample moments and 43 distinct parameters, leaving 93 (136 - 43) degrees of freedom which was over-identified.

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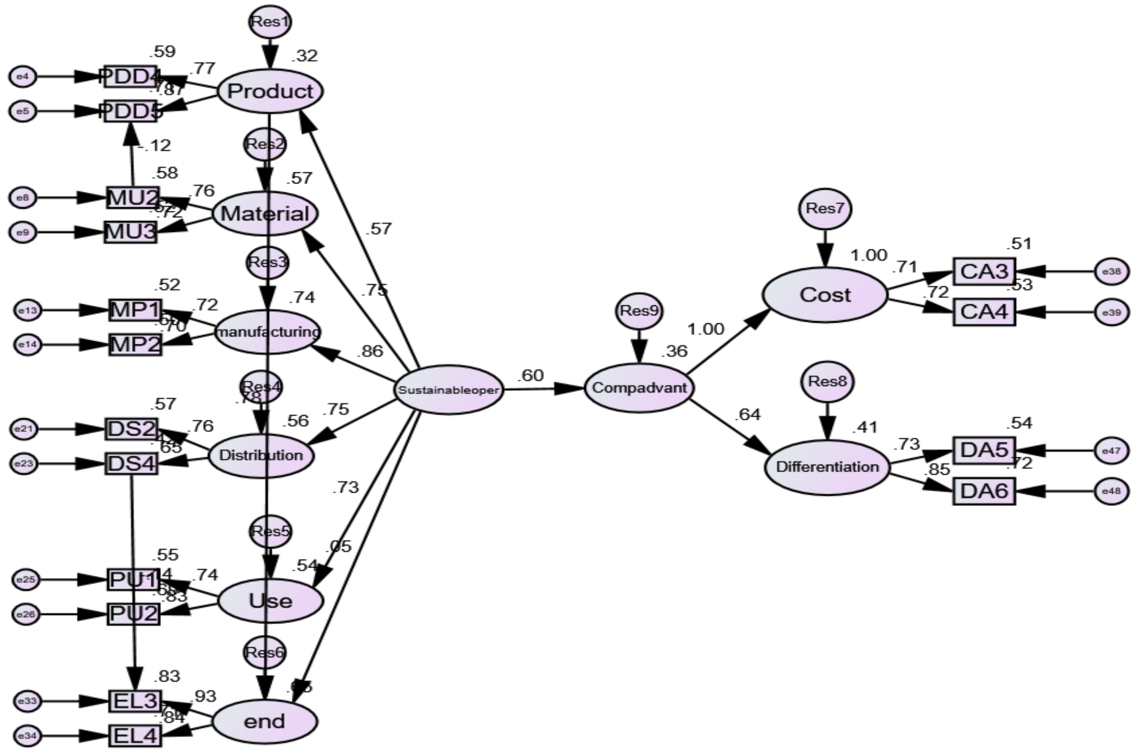

Figure 2. Sustainable Operations Management Practices and Competitive Advantage
Source: Research Data 2020

Table 1. Analysis of a Moment Structures Output Showing Model Fit

Model	Number of Parameters	Chi-Square Likelihood Ratio	Degrees of Freedom	P-Value	CMIN/DF
Default model	43	65.797	93	0.985	0.707
Saturated model	136	0.000	0		
Independence model	16	944.083	120	0.000	7.867

Source: Research Data 2020

The fit indices signified a perfect model fit as seen in Table 2 below. The GFI obtained was 0.948; AGFI was 0.925; and NFI, CFI and TLI were 0.930, 1.000 and 1.043, respectively. The p-value was 0.985 and RMSEA

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was 0.000. Hence, the conclusion drawn was that the model fitted the data perfectly well.

Table 2. Fit Statistics of the Structural Model

Name of Category	Fit Statistic	Recommended	Obtained
Absolute fit	Chi-square significance	P > 0.05	0.985
	RMSEA	< 0.08	0.000
	GFI	> 0.90	0.948
Incremental fit	AGFI	> 0.90	0.925
	NFI	> 0.90	0.930
	CFI	> 0.90	1.000
	TLI	> 0.90	1.043
Parsimonious fit	Chi-square/df	< 3.0	0.707

Source: Research data 2020

Based on the objective of this paper, which was to determine the link between Sustainable Operations Management Practices and competitive advantage in Kenya, the null hypothesis stated that Sustainable Operations Management Practices have no significant influence on firm competitive advantage. From Table 3 below, Sustainable Operations Management Practices had no significant influence on firm competitive advantage was rejected since p-value < 0.001 was less than alpha (α) value = 0.05. Hence, it was concluded that Sustainable Operations Management Practices had a significant influence on firm's competitive advantage.

Table 3. Regression Weight for Hypotheses Tested

			Estimate	Standard Error	C.R.	P	Label
Compadvant	<---	Sustainableoper	0.694	0.172	4.035	***	Supported

Note: *** means p-value at significant level is <0.001 in AMOS output
Source: Research data 2020

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Conclusion and Recommendations

The objective of the paper was to determine the link between Sustainable Operations Management Practices and the competitive advantage of manufacturing firms in Kenya. The CB-SEM was utilized to analyze the link. The model was based on two latent constructs, an exogenous variable (Sustainable Operations Management Practices) and an endogenous variable (competitive advantage). The outcomes revealed that Sustainable Operations Management Practices had a significant impact on a firm's competitive advantage. The Sustainable Operations Management Practices accounted for 36 percent variance in competitive advantage. So, if the variance explained of a specific endogenous construct is to be considered satisfactory, R^2 values should be equivalent to or more than 0.10 (Falk & Miller, 1992). Chin (1998) suggested R^2 values for endogenous latent variables based on 0.67 (substantial), 0.33 (moderate), and 0.19 (weak). Hence, the variance explained was moderate.

The hypothesis formulated stated that Sustainable Operations Management Practices had no significant influence on a firm's competitive advantage. However, findings indicated that Sustainable Operations Management Practices had a significant influence on firm competitive advantage. The link between Sustainable Operations Management Practices and competitive advantage has been studied by various authors and it represents an issue in the literature that is complex. While some authors found a positive link (Bennett, Nunes & Shaw, 2013; Drake & Spinler, 2013), others did not (Wagner, 2005; Watson, Klingenberg, Polito & Geurts, 2004). This paper helped to resolve the inconsistencies by affirming that Sustainable Operations Management Practices had a positive impact on competitive advantage. It also supported NRBV, OST, and TPF theories which grounded this relationship. Sustainable Operations Management Practices potentially play a critical role in the contribution of solutions for challenges faced by humanity. Despite its importance and ongoing efforts, it has not yet fused into the mainstream of operations management research as studies in the area of Sustainable Operations Management Practices are limited (Gavronski, Paiva, Teixeira & de Andrade, 2013). Therefore, this paper adds to knowledge in the less explored field of Sustainable Operations Management Practices.

The results of this paper are consistent with NRBV, which suggests that a firm can gain a competitive edge based on its association with the natural environment (Hart & Dowell, 2011). Pollution prevention strategies like Sustainable Operations Management Practices depend upon tacit skills developed and sharpened through workforce engagement. Thus, this makes it hard to observe and quickly copy, thereby improving an organization's performance and giving it a competitive advantage (Willig, 1994). Product stewardship offers an organization a chance to attain a competitive advantage by enabling communication across departments, functions as well as organizational boundaries to coordinate Sustainable Operations Management Practices among all parties (Schmidheiny, 1992). Sustainable development alludes to technological cooperation and it works with state and business in the building relevant infrastructure, nurturing human resources, and exploring means for achieving competitiveness (Schmidheiny, 1992).

The results reflected the importance of OST in the relationship between Sustainable Operations Management Practices and firm competitive advantage. Hence, it extends to conceptual and empirical research. It recognizes that organizations are not closed systems. Just like any other system, they derive their input from the environment converted into the output that is released to the environment. They are also affected by customer demands, competition, and government regulations (Cummings & Worley, 2014). An organization cannot be autonomous concerning critical resources. To be competitive, they need to take care of this reliance for sustainable development (Wathne & Heide, 2004). As organization acquires resources for their survival, this may lead to the adoption or diffusion of other partner's sustainable practices resulting in competitive advantage (Sarkis, Gonzalez-Torre & Adenso-Diaz, 2010).

The findings provide significant information for the development and review of environmental policy and practice. A clear perspective of the relationship between Sustainable Operations Management Practices and competitive advantage is relevant in designing effective environmental policies. Awareness of this link is vital to government policymakers to achieve environmental goals. By making a sustainable enhancement to manufacturing activities, firms realize operational expense savings and competitive advantage (Schäpke et al., 2017). Regulators may use the findings to persuade other organizations to implement Sustainable Operations Management Practices by the use of voluntary environmental plans and partnership and by presenting enticements to firms that have already implemented Sustainable Operations Management Practices. The research can also help the government in identifying gaps in their present policies and also assist them in making new and better ones.

The main conclusion was that Sustainable Operations Management Practices' efforts of minimizing environmental, economic, as well as social effects, lead to minimized operating costs, enhanced satisfaction of employees, and environmental improvements through product marketing leading to competitive advantage (Shahbazpour & Seidel, 2006). It also leads to unceasing improvement on capital productivity through enhanced customer relationships, employee's productivity, effectiveness, business performance enhancement in addition to competitive edge. This is because the continued existence and competitiveness of organizations are dependent on their practices, as well as capabilities for adapting the external environment, attributable to variation in customer preferences, government regulations, technology as well as competitors (Machuca, Jiménez, & Garrido-Vega, 2011). Companies should, therefore, not view environmental protection activities as detrimental to the company but see it as an opportunity.

Manufacturing advancement has been sluggish in previous years. However, it can be commended that since government rules, regulations, legislations, and a firm's competencies drive Sustainable Operations Management Practices implementation, they should take an initiative of evaluating their policies, make environmental regulation more stringent, and assign additional resources to warrant proper employment of Sustainable Operations Management Practices. It is about time for the link between sustainability and competitiveness to be acknowledged and advanced as a corporate opportunity and a matter of policy. Therefore, there should be a requirement for major changes in the policy process. Sustainability ought to be regarded as an important notion across various sectors and fields and governments are required to shift from concepts to action. The OST confirms the interdependence between the environment and the organization where they both need one another for success, growth, and survival. Managers should, therefore, stop being only shareholders' agents but also being builders of stakeholder relations.

Among the limitation of this paper was that some participants considered the information requested to be confidential and this left some questionnaires unanswered. The findings were also limited to the sectors analyzed in the Kenyan context and only a sample of manufacturing firms registered by the Kenyan Association of Manufacturers was incorporated. All manufacturing firms in Kenya ought to be analyzed for the purpose of generalization and other context needs to be considered. This paper relied deeply on perceived information provided by firm managers, which was prone to bias. Objective data usually gives the best picture and increases validity. Another limitation was the limited sample of interviews realized. Also, future research must include larger samples to generate a wider overview because CB-SEM, which was used in this paper, works well with a large sample.

Up-coming research should capture Sustainable Operations Management Practices in other economic sectors to add confidence in the results. Future research should consider more direct objective measurements. Longitudinal studies should also be considered in the future. This is because the payback of Sustainable Operations Management Practices can be recognized after a long duration rather than the short term. Due to the

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limitation of studies in the area of Sustainable Operations Management Practices, more research should be generated that allows for efficiency in the production systems. Future researchers are encouraged to assess the model of this paper in other contexts and more so extending the paper to the various levels of competitiveness to offer a comprehensive view of such commitments. There is also a need to go into the less explored areas of Sustainable Operations Management Practices and probably examine the prevailing paradigm that presently impacts Sustainable Operations Management Practices.

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