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MODERATING EFFECT OF FIRM AGE AND SIZE ON THE RELATIONSHIP BETWEEN SUSTAINABLE OPERATIONS MANAGEMENT PRACTICES AND COMPETITIVE ADVANTAGE OF MANUFACTURING FIRMS IN KENYA

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Abstract

The Kenyan government has identified manufacturing as one of its big four-agenda for growth and employment creation. However, manufacturing activities consume considerable amounts of resources which are non-renewable and energy intensive, emits toxic wastes leading to negative environmental challenges. Therefore manufacturing firms have to embrace technologies that utilize alternative energy sources and minimize pollution by implementing sustainable operations management practices (SOMPs). SOMPs are environmental initiatives taken to care for the environment, improve life and for economic gains. If appropriately addressed, SOMPs have likelihood of becoming crucial to competitive advantage and a solution to the problems experienced. Sustainable practices implementation requires resources and capability. However, little is known about the moderating effect of firm age and size on the relationship between SOMPs and competitive advantage. For business models to be able to solve real business problems they need to specify moderating variables. The objective of this paper was to examine the effect of firm age and size on the relationship between SOMPs and competitive advantage. The relationship was grounded on the theory of performance frontiers and open system theory. Cross sectional survey design was used. The population of the study was made up of 903 manufacturing firms and the sample size was 300 which was calculated using Slovin's formula. Primary data was collected and covariance-based structural equation modeling was used to analyze it. The test for validity and reliability were also conducted. The findings indicated that, firm age had a significant moderating effect on the relationship between SOMPs and firm competitive advantage hence new firms should aim at adopting the practices early enough to ensure that they enjoy the benefits. The findings also indicated that firm size does not moderate the relationship between SOMPs and firm competitive advantage. This highlights the challenges faced by

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organizations as they grow, such as inflexibility and bureaucratic bottlenecks, which may transform into resistance to change. This study looked at indirect cause hence providing further insights in the area. Researchers as well as specialists are presented with further understanding of reciprocal causal mechanism linking SOMPs and competitive advantage and circumstances shaping that link.

Keywords: Sustainable operations management practices, firm age, firm size, competitive advantage, manufacturing firms

Introduction

Manufacturing firms in Kenya have been linked to environmental problems. They usually face diverse challenges like environmental regulations compliance, sustainable energy consumption and managing waste both solid and liquid (Mwaguni & Munga, 1997). They therefore need to adopt sustainable operations management practices which will take care of the environment. Sustainable practices require long-term investment, enough resources to implement and firms commitment, hence most firms do not implement them early enough (Hart, 2002). The more the years of existence of the firm, the higher the possibility of accumulating capabilities and resources, which enable them to implement SOMPs that may lead to overall improvement and competitive advantage (Birley & Westhead, 1990). Firm size impacts on its proficiency to obtain resources and employ SOMPs, leading to competitive advantage. This is because SOMPs require enough resources and firms commitment (Hart, 2002). Large organizations have more resources and capabilities, which allow them to be very productive and preserve their competitive advantage. Literature suggests that larger organizations which have implemented SOMPs will have a competitive edge over small organizations. This is because big organizations have more assets, skills and competences as compared to smaller firms, enabling them invest in environmental practices such as SOMPs, which gives them a competitive advantage (Ismail & King, 2014). From the viewpoint of economies of scale it can also be seen that as output grows, the average unit cost reduces. The theory of performance frontier argues that the operating frontiers of firms denote distinctive resources which are more vital, intangible assets like know-how or culture of being sustainable through the implementation of SOMPs which are important resource giving an organization a mileage from its competitors. Open system theory confirms the interdependence between the environment and the organization where they both need one another for success, growth and survival (Wathne & Heide, 2004).

Research Problem

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. These firms have been connected to negative environmental impact due to the rising mindfulness of environmental challenges caused by their operations (Galdeano, Ce´spedes, & Martı´nez, 2008). Operations management decisions form part of the key contributors to the anthropogenic impact on the ecosystem. Therefore SOMPs potentially play a critical role in contribution of solutions to challenges faced by humanity. In spite of the current efforts, sustainable practices are yet to merge into the mainstream of operations. The SOMPs have emerged as a new competitive requirement as efforts for minimizing environmental, economical, as well as social effects lead to minimized operating costs, enhanced satisfaction of employees and environmental improvements leading to competitive advantage (Shahbazpour & Seidel, 2006).

Successful implementation of SOMPs requires resources and capability (Moldan, Janouskova, & Hak, 2012). Bowen (2002) asserts that firm's resources enhances its exploration of costly and risky environmental investments. The years of existence of the firm can be linked to learning curve and high possibility of accumulating properties and competences

that may amount to overall improvement and competitive advantage (Birley & Westhead, 1990). Firm size impacts on its proficiency to obtain resources and employ SOMPs, leading to competitive advantage, this is because SOMPs require long-term investment, enough resources and firm's commitment (Hart, 2002). However, little is known about the moderating effect of firm age and size on the relationship between SOMPs and competitive advantage. In order to be complete and to give solution to actual business problems, business models should specify moderating variables (Namazi & Namazi, 2016). Researchers as well as specialists need to be presented with further understanding of reciprocal causal mechanism linking SOMPs and competitive advantage and circumstances shaping that link

Limited studies focused their attention on the moderating effect of firm characteristics on the association between SOMPs and firm competitive advantage. Kannadhasan and Nandagopal (2009), investigated the effect of firm size in regulating the association between strategy and performance. The study's focus was only on the size of the firm. Majumdar (1997), explored the effect an entity's size and age has on the level of output and gains. In all these studies, the concepts and context (India) were different from the current study. The context of this study was Kenya. African countries face major environmental challenges (International Labour Organization (ILO), 2012) hence clear understanding and sufficient knowledge will facilitate implementation and problem solving process hence the need for a research in this area. Odock, Awino, Njihia and Iraki (2016) did a study on the effect of GSCM practices on performance of ISO 14001 certified manufacturing firms. The study used partial least squares structural equation modeling and moderated regression analyses and it was on some of the facets of SOMPs. However a study which considers all the facets of SOMPs is important, this study looked at the whole product life cycle. It also used CB-SEM, hence allowed for more sophisticated and comprehensive analyses (Hair, Black, Babin & Anderson, 2010).

Research Objectives

The objectives of this study were to:

1. Examine the moderating effect of firm age on the relationship between SOMPs and competitive advantage

2. Examine the moderating effect of firm size on the relationship between SOMPs and competitive advantage

Literature Review

Sustainability is majorly perceived as an important success factor within the long run strategy of a business and enterprises that adopt it are believed to attain differentiated competitive edge over their rivals (Crittenden, Crittenden, Ferrell, Ferrell & Pinney, 2011). Firm characteristics are the demographic and managerial variables of a firm's internal environment, which play a crucial part in the attainment of competitive edge (Zou & Stan, 1998). Bowen (2002) asserts that firm's resources enhance its exploration of costly and risky environmental investments. Firm characteristics capture the exceptional organizational attributes, which influence the variation in tactics and performance outcomes among variety of companies (Rumelt, 1998). The RBV characteristically provides enlightenment for the firm characteristics on the performance outcomes and competitiveness within an

industry (Wernerfelt, 1984; Peteraf, 1993). Firm's age and size were considered as the internal characteristics, which influenced the relationship between SOMPs and firm competitive advantage (Kogan & Tian, 2012).

The link between firm age, size and competitive advantage has been a focus of various theoretic (structural inertia theory, liability of obsolescence, learning by doing and senescence). Organizational inertia, is the condition of being too old or big to adjust. The years of existence of the firm can be linked to learning curve. The more the years of existence of the firm, the higher the possibility of accumulating capabilities and resources, which enable them to implement SOMPs that may lead to overall improvement and competitive advantage (Birley & Westhead, 1990). Due to the experience and reputation of older firms, they have the likelihood of attracting first class vendors who may have implemented SOMPs, which may diffuse in the organization or they may give them innovative ideas on how to improve their competitive advantage. Young entities may only account for a small part of supplier's output meaning their capability of integrating suppliers into their SOMPs may not be feasible, hence hinders achievement of superior performance (Koufteros, Cheng, & Lai, 2007). Competitive advantage is attained through a combination of green information, knowledge as well as resources (Schoenherr & Wagner, 2016).

A different stream of research, however, advanced a contrary view. The argument is that as firms get older they suffer bureaucratic ossification and inertia that goes alongside age, hence they are unable to be flexible in adjusting rapidly to varying circumstances leading to likeliness of losing out the performance share to firms which are newer and more responsive (Marshall, 1956). This stand is explained by the liabilities of senescence, which is inefficiency of organizations internal environment arising from aging of a firm (Hannan, 1998). It may also be attributed to Gardner's (1965) organismic life cycle analogy that, just as plants and people, organizations to have a life cycle period, that is, a time where they enjoy a lot of strength and ability and an old age when all these diminishes and exit becomes almost inevitable. In the same vein, this relationship may also be observed from the viewpoint of liability of obsolescence, whereby as organizations get old, their performance declines as well (Barnett, 1990). Competition and rivalry which causes environmental drift can be attributed to the decline (Utterback & Abernathy, 1975). The growing external incompatibility with the environment leads to liabilities of obsolescence.

Bahk and Gort (1993) and Garnsey (1998) hypothesis of learning by doing suggests that there is a possibility that firms can improve their productive efficiency by learning from experience as the firms age increases. New firms are disadvantaged as they are required to make search processes to find a way out every time they encounter new a problem (Garnsey, 1998). Learning process introduces a series of problem-solving procedures hence eliminating the need for open search process in problem-solving response. Birley and Westhead (1990) established that, the more the years of existence of the firm, the higher the possibility of accumulating properties and competences, enabling them to implement SOMPs that may lead to overall improvement and competitive advantage. Older firms also have a likelihood of attracting first class vendors who may have implemented SOMPs, which may diffuse in

the organization and improve their competitive advantage. The capability of integrating suppliers into young entities SOMPs may not be feasible because they only account for a small part of supplier's output (Koufteros, Cheng, & Lai, 2007). This paper, therefore posit that the relationship between SOMPs and competitive advantage of the firm increases with the age.

The firm size and competitive advantage have had robust stands beginning from the notable Gibrat (1931) hypothesis which states that the growth of a firm does not depend on its size. In connection with Gibrat (1931), proportionate growth hypothesis, Jónsson (2007) establish an insignificant weak connection between size and profitability. Similarly, Goddard, Molyneux and Wilson (2004) establish a weak evidence of an association between size and profitability. Others who found a negative relationship are (Ammar, Hanna, Nordheim & Russell, 2003; Goddard, Tavakoli & Wilson, 2005; Amato & Burson, 2007). Structural inertia theory has explained the reason behind the weak and negative findings (Hannan & Freeman, 1984) by arguing that, the volume of bureaucracy in an organization increases with increase in size of the firm and this might result to resistance to change leading to a decrease in profit levels hence competitive advantage. Based on other arguments extended in literature, larger organizations have more resources, skills and capabilities as compared to smaller firms which struggle to garner them, enabling them to easily transfer information, try costly and risky environmental investments such as SOMPs, which gives them a competitive advantage (Ismail & King, 2014). Moreover, small firms have little likelihood of hiring specialists with wide ranging experience to directly handle SOMPs issues, as seen from natural resource based view. This tacit skills can lead to competitive advantage (Leonidou, Christodoulides, Kyrgidou & Palihawadana, 2017). The positive effect of size may also be seen from the viewpoint of economies of scale. As output grows, the average unit cost reduces. This paper, therefore, proposes that the bigger the firm, the greater the competitive advantage due to the implementation of SOMPs.

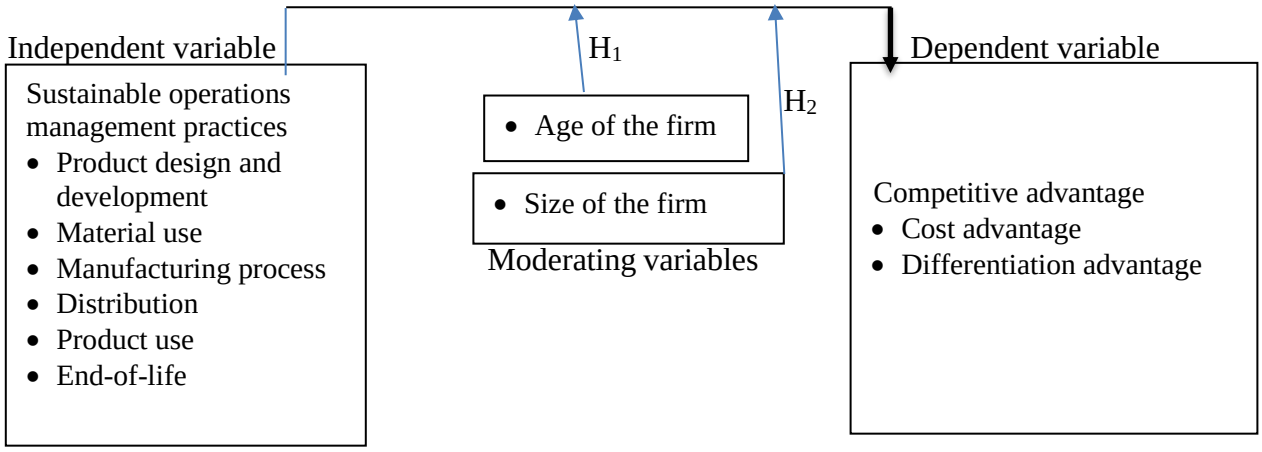
Limited studies focused their attention on the moderating effect of firm age and size on the association between SOMPs and firm competitive advantage, they include: Kannadhasan and Nandagopal (2011), who investigated the effect of firm size in regulating the association between strategy and performance. It was a survey, which found a substantial link among strategy, firm size and performance. The study focus was only on the size of the firm. Majumdar (1997), explored the effect an entities size and age on level of output and gains. The results showed that firms that have existed for longer are likely to experience low profit but high productivity levels, while in the contrary larger firm are more profitable but not as productive. It was a survey whose focus was on firm's size and age only and in both studies, the context was India. This paper context was Kenya and it looked at the moderating effect of firm size and age. Odock, Awino, Njihia and Iraki (2016) did a study on the effect of GSCM practices on performance of ISO 14001 certified manufacturing firms and found out that firm age and size does not moderate the relationship. The study used partial least squares structural equation modeling and moderated regression analyses and it was on some of the facets of SOMPs. This study looked at the whole product life cycle and used covariance-based structural equation modeling, hence allowed for more

sophisticated and comprehensive analyses (Hair et al., 2010).

This study was grounded on two theories; Theory of performance frontiers (TPF) and Open system Theory (OST). TPF argues that the operating frontiers of firms denote distinctive resources which are more vital than the asset frontiers in competitive advantage achievement. This is because they are specific to a particular firm, rare and hard to mimic (Vastag, 2000). It states that unique operating practices such as SOMPs give a firm more competitive advantage than the asset frontier (Schmenner & Swink, 1998). OST recognizes that organizations are not closed systems, just like any other system, they derive their input from the environment converted into output that is released to the environment (Cummings & Worley, 2014). It confirms the interdependence between the environment and the organization where they both need one another for success, growth and survival. To be competitive they need to take care of this reliance for sustainable development (Wathne & Heide, 2004). The organization takes care of the environment by adoption of SOMPs leading to competitive advantage (Ashmos & Huber 1987).

Conceptual Framework

Figure 1 shows the various relationships that the study focused on. They include the relationship between SOMPs (product design and development; material use; manufacturing process; distribution; product use; end-of-life) and competitive advantage (cost and differentiation advantage); the moderating effect of firm age on the relationship between SOMPs and competitive advantage and the moderating effect of firm size on the relationship between SOMPs and competitive advantage.



Study Hypotheses

Figure 1 Conceptual Framework

On the basis of the objectives of this study and the conceptual framework, the hypotheses were formulated as follows:

$H_{1:}$ Firm age did not have a significant moderating effect on the relationship between SOMPs and firm competitive advantage

$H_{2:}$ Firm size did not have a significant moderating effect on the relationship between SOMPs and firm competitive advantage.

Research Methodology

Descriptive cross sectional survey design was used It is suitable when the main goal is to find out whether substantial relationships amongst variables are in existence at any point in the course of time and where data is gathered at a point in time across various firms (Cooper, Schindler, & Sun, 2013). The 903 manufacturing firms registered with the Kenya Association of Manufacturers (KAM) made up the population of the study. A sample size of 300 was selected using Slovin's formula. Primary data was collected using a designed questionnaire by way of 'drop and pick later' method. Diagnostic tests were conducted; Scatter plots were utilized to check for linearity among the dependent and independent variables. To test for normality, Shapiro-Wilk test was used. Multicollinearity was evaluated by computing tolerance and Variance Inflation Factor (VIF) while heteroscedasticity was tested using the Koenker test. Reliability and validity tests were also conducted. To test reliability of the instruments Cronbach's alpha was utilized. Internal consistency of latent constructs was evaluated through composite reliability. For purposes of determining the measurement scale reliability, the item to total correlation for all indicators was determined. The internal consistency was measured by obtaining the average variance extracted (AVE). Content validity of the measuring instrument was ensured by constructing the questionnaire from prevailing literature in addition to examination of measurement items by other researchers and experts. For purposes of assessing the convergent, construct and discriminant validity, confirmatory factor analysis was utilized. Kaiser-Meyer-Olkin (KMO) and Bartlett's test of sphericity were first conducted for all constructs. Some of the data collected was analyzed using descriptive statistics while covariance-based structural equation modeling was used to analyze the various relationships to achieve the objectives, it allows for more sophisticated and comprehensive analyses (Hair et al., 2010). The data obtained was analyzed using covariance-based structural equation modeling.

Results and Discussion

Table 1 shows the characteristics of the respondents which include firms' background information from the sub-sector, years of operation, number of employees, staff's highest level of education and years of experience.

Table 1 Characteristics of the Respondents

Features	Category	Frequency	Percent
Manufacturing sub sector	Pharmaceutical and Medical Equipment	5	3.3
	Metals and Allied	14	9.3
	Textile and Apparels	13	8.7
	Energy, Electrical and Electronics	9	6.0
	Paper and Board	7	4.7
	Plastic and Rubber	15	10.0
	Chemicals and Allied	15	10.0
	Food and Beverages	41	27.3
	Building, Mining and Construction	10	6.7
	Motor vehicles and Accessories	6	4.0
	Leather and Footwear	1	0.7
	Timber, Wood and Furniture	11	7.3
	Fresh Produce	3	2.0
	Total	150	100.0
Length of operation of firm	1-5 years	13	8.7
	6 to 10 years	25	16.7
	11 to 15 years	23	15.3
	16 to 20 years	11	7.3
	Above 20 years	78	52.0
	Total	150	100.0
Size of staff	1 to 50	49	32.7
	51 to 100	32	21.3
	101 to 150	17	11.3
	151 to 200	8	5.3
	Above 200	44	29.3
	Total	150	100.0
Highest level of education	Certificate	5	3.3
	Diploma	32	21.3

Features	Category	Frequency	Percent
	Bachelor	70	46.7
	Masters	40	26.7
	Doctorate	3	2.0
	Total	150	100.0
Length of working	1 to 5 years	36	24.0
	6 to 10 years	53	35.3
	11 to 15 years	30	20.0
	16 to 20 years	20	13.3
	Above 20 years	11	7.3
	Total	150	100.0

Source: Research data, 2020

Table 1 shows that data obtained was from all 13 sub sectors. Food and beverages firms contributed to most of the data at 27.3 percent, followed by plastic and rubber and chemicals and allied both at 10 percent, while the least number of firms were from leather and footwear sector. The reason behind this is that a bigger percentage of firms in the sector are food and beverage firms while leather and footwear makes the least percentage. Regarding the length of operation of the firms, the results show that 8.7 percent of the firms surveyed had operated between 1 and 5 years, 16.7 percent between 6 and 10 years while 15.3 percent had been in operation for 11 and 15 years and 7.3 percent had operated for 16 and 20 years. A good percentage of the firms (52 percent) had existed for over 20 years.

In terms of staff size, 54 percent had 100 employees, while 46 percent had more than 100 employees. This may be due to harsh economic times which have forced many firms to do more with less by cutting on the number of employees. The two characteristics imply that most of the firms are large and have been in existence for some time, hence have accumulated enough resources to enable them implement SOMPs.

The participants also specified their highest level of education and years of experience in the manufacturing firms. Majority of them (75.4 percent) were bachelor's degree holders and above, hence well-educated and knowledgeable; 76 percent had at least six years working experience giving them enough skills and expertise to be able to implement the various SOMPs. This is also an indication that, they have a good understanding of the firm and had been there long enough to see the firm implement the practices. Management competences are fundamental to the process of recognition, development, implementation as well as deployment of resources into valuable activities of the firm like SOMPs for achievement of competitive advantage (Mahoney, 1995).

Reliability and Construct Validity

All KMO measures were within the required values, showing that all latent constructs were above the 0.5 threshold (Kaiser, 1974). Bartlett's test of Sphericity revealed that all the latent constructs had Chi-square values that were significant (p-value = 0.000) at a level less than 0.05 (Bartlett, 1950). Factor loadings were all within the acceptable range, while Cronbach's alpha was in line with 0.7 coefficient adopted by the study. The item – to-total correlation were all above the threshold total correlation of 0.3 hence reliability and construct validity were confirmed. 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. 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 items standardized loadings were above the ideal level, hence confirmation of convergent validity.

Composite reliabilities of construct had a value ranging from 0.66 to 0.91 indicating adequate internal consistency as values ranging from 0.60 to 0.70 are also deemed acceptable (Hair et al., 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 ranged from 0.71 to 0.91, where the lowest AVE value was 0.71 which exceeded the largest squared correlation 0.63. This indicated that the variance shared among factors were lower than of individual factors, hence discriminant validity was confirmed.

Diagnostic tests

To test linearity, the coefficient of determination (R^2) was 0.3483, which showed that the portion of variance in competitive advantage that was accounted for by SOMPs was moderate (Wong, 2013). The correlation coefficient (r) was 0.590 which was above 0.3, indicating that the relationship was positive and moderately strong. The Shapiro-Wilk test p-values were all more than 0.05; all the critical region for the kurtosis did not exceed 3.0 and skewness values were also all below 1.0, hence the data was normally distributed. Absence of multicollinearity was indicated by Variance Inflation Factor (VIF) values ranging from 1.6 to 2.5 which were all below the threshold of 10 and tolerance values of less than 1. Correlation coefficient values ranged from 0.378 to 0.683 which were all below 0.8. The p-value as indicated by Koenker test was 0.596 which was more than 0.05 hence null hypothesis that data was homoscedastic was not rejected.

Sustainable Operations Management Practices, Firm Age and Competitive Advantage

The first objective of this study examined the moderating effect of firm age on the relationship between SOMPs and competitive advantage. Figure 2 shows that when SOMPs increased by 1 SD, competitive advantage increased by 0.69 SD and when the firms age increased by 1 SD, competitive advantage reduces by 0.20 standard deviation. When the interaction (product) of SOMPs and firms age increased by 1 SD, competitive advantage increased by 0.21 SD. It was estimated that the 0.47 (estimate R^2) variance in competitive advantage was described by the predictor variables.

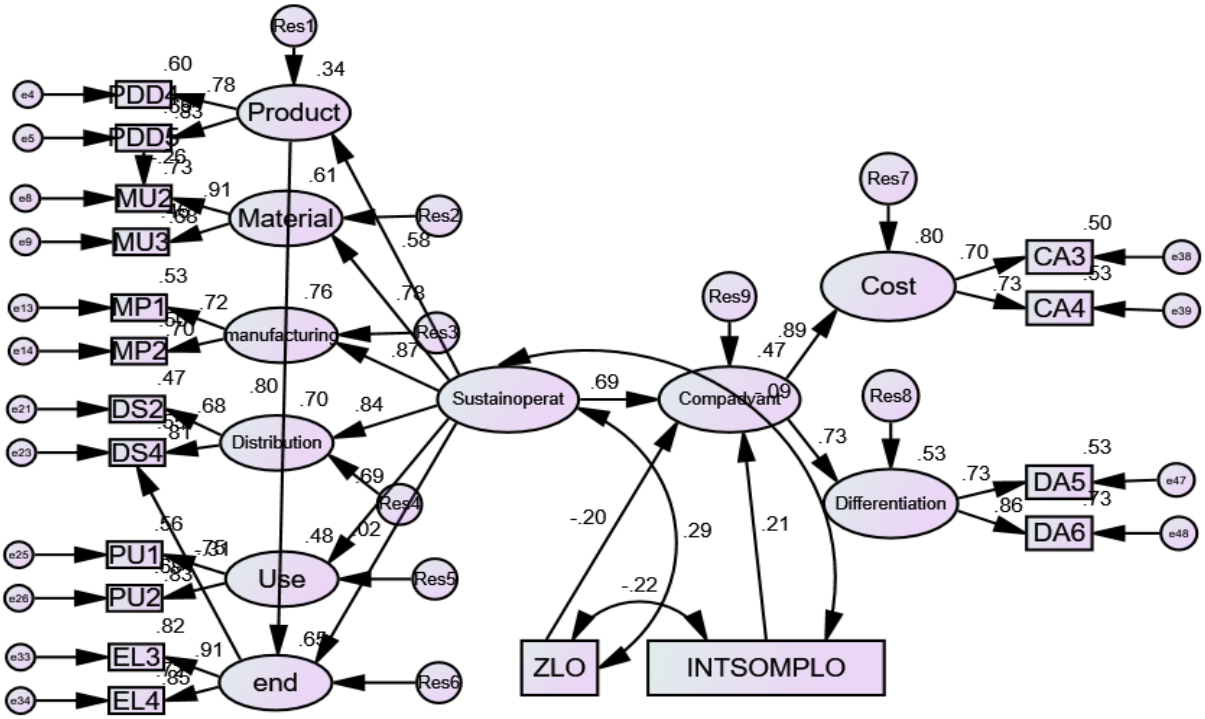


Figure 2 Sustainable Operations Management Practices, Firm Age and Competitive Advantage

Table 2 Analysis of a Moment Structures Output Showing Model Fit

Model	Number of Parameters	Chi-Square Likelihood Ratio (CMIN)	Degree of Freedom (DF)	P-Value	CMIN/DF
Default model	51	94.667	120	0.958	0.789
Saturated model	171	0.000	0		
Independence model	18	997.143	153	0.000	6.517

The fit indices provided a perfect model fit as seen on Table 2. The Goodness-of-Fit Index obtained was 0.936; Adjusted Goodness-of-Fit Index was 0.908; and Normed Fit Index, Comparative Fit Index, Tucker Lewis Index were 0.905, 1.000 and 1.038, respectively. The Root Mean Square Error Approximation was 0.000 and the p-value was 0.958. Hence, the conclusion was that the model fitted the data perfectly.

Table 3 Fit Statistics of the Structural Model

Name of Category	Fit Statistic	Recommended	Obtained
Absolute fit	x^2 significance	P > 0.05	0.958
	RMSEA	< 0.08	0.000
	GFI	> 0.90	0.936
Incremental fit	AGFI	> 0.90	0.908
	NFI	> 0.90	0.905
	CFI	> 0.90	1.000
	TLI	> 0.90	1.038
Parsimonious fit	x^2 /df	< 3.0	0.789

The null hypothesis for objective 1 was stated as follows - H_1: firm age has no significant moderating effect on the relationship between SOMPs and firm competitive advantage**.** Since the p-value < 0.001 was less than α-value = 0.05 as seen in Table 3, the null hypothesis that SOMPs and competitive advantage were not significant was rejected, hence SOMPs had an influence on competitive advantage. In addition, firm's age had a significant effect on competitive advantage since p-value = 0.048 was less than α-value = 0.05; and lastly, the interaction effect was significant since p-value = 0.024 was less than α-value = 0.05, hence it was concluded that the moderating effect of firm's age on the relationship between SOMPs and competitive advantage is significant.

Table 4 Regression Weight for Hypotheses Tested

			Estimate	S.E.	C.R.	P	Label
Compadvant	<---	Sustainoperat	.681	.170	4.009	***	Significant
Compadvant	<---	ZLO	-.110	.055	-1.981	.048	Significant
Compadvant	<---	INTSOMPLO	.108	.048	2.254	.024	Significant

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

Sustainable Operations Management Practices, Firm Size and Competitive Advantage

The second objective of this study was to examine the moderating effect of firm size on the relationship between SOMPs and competitive advantage. Figure 3 shows that when SOMPs increased by one standard deviation, competitive advantage increased by 0.63 standard deviation; when firm size increased by one standard deviation competitive advantage decreased by 0.05 standard deviation; and when the interaction (product) of SOMPs and firm size increased by one standard deviation, competitive advantage increased by 0.09 standard deviation. It was estimated that the predictor variables accounted for 37% variance in competitive advantage. The model was recursive with a sample size of 150 and the variables were 53, 18 observed, 35 unobserved, 28 exogenous and 25 endogenous. Table 5 shows that, it had positive degrees of freedom (121) and there were 171 distinct sample moments and 50 distinct parameters, leaving 121 (171-50) degrees of freedom.

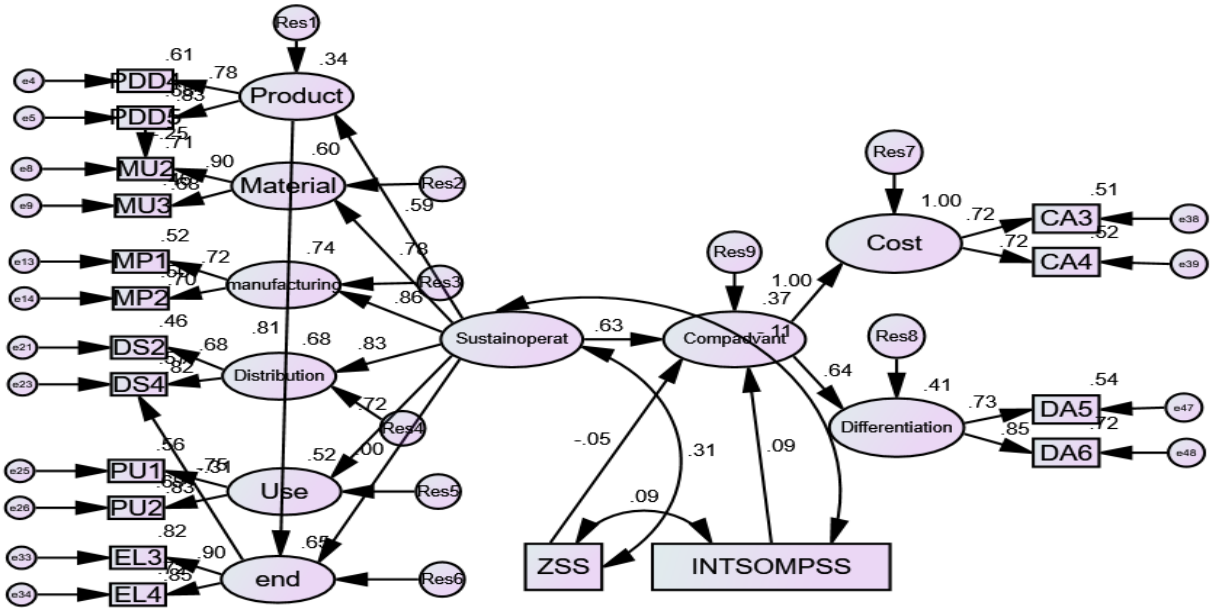


Figure 3 Sustainable Operations Management Practices, Firm Size and Competitive Advantage

Table 5 Analysis of a Moment Structures Output Showing Model Fit

Model	Number of Parameters	Chi-Square Likelihood Ratio (CMIN)	Degree of Freedom (DF)	P-Value	CMIN/DF
Default model	50	93.892	121	.968	.776

Model	Number of Parameters	Chi-Square Likelihood Ratio (CMIN)	Degree of Freedom (DF)	P-Value	CMIN/DF
Saturated model	171	.000	0		
Independence model	18	986.952	153	.000	6.451

Table 6 shows that the fit indices provided a perfect model fit since Goodness-of-Fit Index was 0.936; Adjusted Goodness-of-Fit Index was 0.910; Normed Fit Index was 0.905; Comparative Fit Index was 1.000 and Tucker Lewis Index was 1.041. The Root Mean Square Error Approximation was 0.000 and the p-value was 0.968. Hence, the conclusion arrived at was that the proposed model fitted the data very well.

Table 6 Fit Statistics of the Structural Model

Name of Category	Fit Statistic	Recommended	Obtained
Absolute fit	Chi-square significance	P > 0.05	0.968
	RMSEA	< 0.08	0.000
	GFI	> 0.90	0.936
Incremental fit	AGFI	> 0.90	0.910
	NFI	> 0.90	0.905
	CFI	> 0.90	1.000
	TLI	> 0.90	1.041
Parsimonious fit	Chi-square/df	< 3.0	0.776

The null hypothesis for the objective H_2: was that firm size has no significant moderating effect on the relationship between SOMPs and firm competitive advantage. It was rejected since the p-value < 0.001 was less than α-value = 0.05 as shown in Table 6, hence concluded that the relationship between SOMPs and competitive advantage was significant. Firm size had no significant effect on competitive advantage since the p-value = 0.564 was more that α-value = 0.05 and the interaction effect was not significant since the p-value = 0.324 was more than α-value = 0.05. It was, therefore, concluded that the moderating effect of firm size on the relationship between SOMPs and competitive advantage were not significant and the null hypothesis is not rejected.

Table 7 Regression Weight for Hypotheses Tested

			Estimate	S.E.	C.R.	P	Label
Compadvant	<---	Sustainoperat	0.702	0.173	4.063	***	Significant
Compadvant	<---	ZSS	-0.034	0.060	-0.577	0.564	Not significant
Compadvant	<---	INTSOMPSS	0.057	0.057	0.985	0.324	Not significant

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

Conclusion

The first objective entailed the examination of the effect of firm age on the relationship between SOMPs and competitive advantage. The model was based on the argument that firm age has no significant moderating effect on the relationship between SOMPs and firm competitive advantage. The findings indicates that firm age had a significant moderating effect on the relationship between SOMPs and firm competitive advantage. It was estimated that 47% (estimate R^2) of the variance in competitive advantage was accounted for by the predictor variables firm age. The variance explained was above moderate hence adequate. The alternate hypothesis was therefore accepted that firm age had a significant moderating effect on the relationship between SOMPs and firm competitive advantage. The results were robust and conforms to Bahk and Gort (1993) and Garnsey (1998) hypothesis of learning by doing.

The theory of learning suggests that there is a possibility that firms can improve their productive efficiency by learning from experience as the firms age increases (Balik & Gort, 1993). New firms are disadvantaged as they are required to make search processes to find a way out every time they encounter a new problem (Garnsey, 1998). Learning process introduces a series of problem-solving procedures hence eliminating the need for open search process in problem-solving response. Birley and Westhead (1990) established that, the more the years of existence of the firm, the higher the possibility of accumulating properties and competences, enabling them to implement SOMPs that may lead to overall improvement and competitive advantage. Older firms also have a likelihood of attracting first class vendors who may have implemented SOMPs, which may diffuse in the organization and improve their competitive advantage. The capability of integrating suppliers into young entities may not be feasible because they only account for a small part of supplier's output (Koufteros, Cheng, & Lai, 2007).

The second objective of the study entailed the examination of the effect of firm size on the relationship between SOMPs and competitive advantage. The model was based on the argument that firm size has no significant moderating effect on the relationship between SOMPs and firm competitive advantage. It was established that firm size had no significant moderating effect on the relationship between SOMPs and firm competitive advantage. It was estimated that 37% (estimate R^2) of the variance in competitive advantage was explained by the predictor variables firm size. The variance explained was above moderate hence adequate. Based on the argument extended in literature, it was expected that larger organizations which

have implemented SOMPs will have a competitive edge over small organizations.

The reason behind this is that big organizations have more assets, skills and competences as compared to smaller firms which struggle to garner them, enabling them to easily transfer information, try costly and risky environmental investments such as SOMPs, which gives them a competitive advantage (Ismail & King, 2014). Moreover, small firms have little likelihood of hiring specialists with wide ranging experience to directly handle SOMPs issues, as seen from natural resource based view, this tacit skills may lead to competitive advantage (Leonidou et al., 2017). The positive effect of size may also be seen from the viewpoint of economies of scale. As output grows, the average unit cost reduces. However, contrary to the expectations, the outcomes revealed that size was not a factor in determining competitive advantage due to implementation of SOMPs by a firm. The result corroborates the findings of Evans (1987); Goddard, Tavakoli, and Wilson (2005); Amato and Burson (2007) and Ammar et al. (2003) and the argument of structural inertia.

The firm size and competitive advantage have had robust stands beginning from the notable Gibrat (1931) hypothesis which states that the growth of a firm does not depend on its size. In connection with Gibrat (1931), proportionate growth hypothesis, Jónsson (2007) establish an insignificant weak connection between size and profitability. Similarly, Goddard, Molyneux, and Wilson (2004) establish a weak evidence of an association between size and profitability. Others who found a negative relationship are (Ammar et al., 2003; Goddard et al., 2005; Amato & Burson, 2007). Structural inertia theory has explained the reason behind the weak and negative findings (Hannan & Freeman, 1984) by arguing that, the volume of bureaucracy in an organization increases with increase in size of the firm and this might result to resistance to change leading to a decrease in profit levels hence competitive advantage. Therefore, manufacturing firms should implement SOMPs as there are possible benefits which comes with employment.

Recommendations

Firms' operation management choices are the main cause to anthropogenic conditions on ecology sustainability, hence an important stream. As seen, the age of the firm moderates the relationship between SOMPs and firm competitive advantage therefore new firms should aim at adopting the practices early enough to ensure that they enjoy the benefits, this is because as they implement them they will be learning and become competent with time and this will give them a competitive egde over their rivals. More so the paybacks of SOMPs can be recognized after a long duration rather than short duration of time.

Organization size, does not moderate the relationship between SOMPs and competitive advantage. Manufacturing firms registered with KAM are perceived to be large, hence have accumulated enough resources to enable them implement SOMPs. The SOMPs require enough resources to implement and firms commitment, hence most firms do not implement them early (Hart, 2002). This shows that small organization do not have the resources needed to implement SOMPs hence the government may recognize their part in availing the essential enticements to enable proper adoption of SOMPs.

Limitation

Among the limitation of this paper was that most organizations were unwilling to disclose their performance data mostly because of fear of the information being leaked to competitors. The findings were also limited to the sectors analyzed in the Kenyan and only a sample of manufacturing firms were incorporated, therefore, the results from this research should be generalized with caution. The information collected from the primary source on SOMPs, competitive advantage and firm characteristics was perceived information, which was prone to biasness.

Suggestions for Further Research

The researcher suggests future research study SOMPs in other economic sectors as they also form part of the contributors to the advancement of the economic system. In addition, it is relevant to take note of the fact that this paper picked its representative sample from the manufacturing firms in a developing country (Kenya). It is likely that it may not be practical to generalize the outcomes of the paper to a developed country or any developing country having different economic and environmental guidelines from the context of this paper. So, future researchers are encouraged to assess the model of the paper in other contexts. Previous studies did not consider much of moderating effect on the relationship between the two variable hence future studies should in cooperate other aspects as moderator variables in the model to bring more understanding.

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