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Supply Chain Integration, Competitive Advantage, Environmental Dynamism and Performance of Large-Scale Manufacturing Firms in Kenya

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Abstract

Intense competitive pressures have forced firms to go beyond their neighbourhoods to achieve competitive advantage. A feasible course of action for firms is embracing supply chain integration. However, there is concern on whether implementing supply chain integration results in enhanced firm performance. Hence, the major aim of this research was to investigate the link connecting supply chain integration implementation and performance of large manufacturing companies in Kenya. In particular, the study examined the link connecting supply chain integration, competitive advantage, environmental dynamism to firm performance. The study was anchored on four theories; resource-based view, resource dependence theory, systems theory and network theory. A cross-sectional descriptive research design was applied with primary data. The respondents of the study were persons overseeing supply chain functions in the sampled firms. From a sample size of 200 firms, 94 usable questionnaires were obtained resulting in a response proportion of 47%. The main data analysis method was partial least squares structural equation modelling (PLS-SEM). The study found that supply chain integration, competitive advantage and environmental dynamism had a significant combined effect on firm performance. The study affirms that the performance of manufacturing firms in Kenya can be strengthened by implementation of supply chain integration. This helps to settle the debate to some extent on whether it is fruitful for organizations to integrate their supply chain operations. These outcomes are also in congruence with resource-based perspective in the sense that integrating internal operations can be regarded as a rare, non-substitutable, valuable and imperfectly imitable resource. Moreover, the findings of the study are expected to provide directions to scholars on the

possible influence of supply chain integration on organisational performance with the possibility of competitive advantage and environmental dynamism acting as mediation and moderation variables respectively. This is particularly pertinent in the context of the developing world where such studies are scarce.

Keywords

Supply Chain Integration, Competitive Advantage, Environmental Dynamism, Firm Performance, PLS-SEM

1. Introduction

Intense competitive pressures have forced enterprises to go beyond their neighbourhoods to achieve competitive advantage. Sroka and Szántó (2018) argue that organisations have found themselves working in an environment which is rapidly changing due to globalization, vicious competition, diversification, rising demands and rising expectations of consumers and greater demand on corporate social responsibility. Fawcett et al. (2008) argue that the day may come when firms will have to choose which supply chain they are going to participate in since competition will be between supply chains. To succeed in this, organisations will require close collaboration among the participants in the interfirm activities within the supply chain. A means of achieving this is for them to integrate their operations; hence the concept of supply chain integration (SCI).

Integration of the supply chain can be described as the development of alliances between industries and other organisations in the supply chain so as to generate an efficient and effective movement of information, resources, parts and materials to create valuable services and products for customers speedily and at low cost (Flynn et al., 2010). Koufteros et al. (2014) argue that supply chain integration can be used to achieve better behavioural response to some kinds of uncertainty through facilitation of lateral relations which advance coordination, collaboration and control of materials and information between supply chain members.

Competitive advantage can be described as the disparity between two or more participants on any possible dimension that enables one to create better value for the customer than the other (Ma, 2000). Ma (2000) further argues that this definition extends on Porter (1985) in underscoring the significance of value creation for the customer. It drills down from the general kinds of competitive advantage such as cost and differentiation to a more elementary level, which facilitates operationalization. Competitive advantage acted as mediating variable on the relationship between SCI and firm performance as proposed by researchers in supply chain management (Dikshit & Trivedi, 2012; Le & Ikram, 2022). Tracey et al. (1999) contend that high quality and reliability, timely delivery, fast new product introduction, enhanced customer service and enhanced deploy-

ment of capital, and not just cost reduction, are the main sources of competitive advantage in the post-industrial environment.

According to Aloulou and Fayolle (2005), environmental dynamism (ED) is the instability of the market for a firm, the unceasing changes that take place in technological situations and the unpredictability of competitors and customers. Environmental dynamism is one among other determinants of environmental uncertainty (the others being munificence, hostility and complexity). This study focused on environmental dynamism since it has been proven to be the most dominant determining factor of environmental uncertainty, as noted by Joshi and Campbel (2003). From the definition of environmental dynamism, four sources of environmental dynamism can be identified: supplier, customer demand, competitor and technological. Nakku et al. (2013) contend that supplier dynamism is the degree of change and unpredictability of delivery performance and quality of product from the suppliers.

Firm performance or organizational performance is the extent to which an organization attains its financial and market goals in relation to the industry average, as defined by Green et al. (2012). It is the firm's performance at the strategic level, in contrast to operational performance which is at the process or work unit level. Shook et al. (2009) argue that a way of improving financial performance is to strategically forge closer relations with partners in supply chains to reduce supply and demand uncertainty.

Manufacturing firms in Kenya contributed 7.6 percent to GDP in 2020 (Kenya National Bureau of Statistics, 2021). It employs approximately 316,900 people representing 11.56 percent of formal employment and 2,933,900 labourers accounting for 20.22 percent of informal employment (Kenya National Bureau of Statistics, 2021). The sector's total employment averaged 18.9 percent, being second to the agriculture industry. According to Kenya Association of Manufacturers (2018), manufacturing share of GDP has averaged 10 percent from 1964 to 1973, rising marginally to 13.6 percent from 1990 to 2007 and dipping below 10 percent in recent years. In comparison, countries comparable to Kenya economically at independence like Democratic Republic of Congo, Vietnam, Cameroon, Malaysia and Bangladesh have their manufacturing sector contribution to GDP at 20.9 percent, 16.75 percent, 14.42 percent, 22.31 percent and 18 percent respectively (World Bank Group, 2021).

2. Literature Review

Due to the combination of direct, mediating and moderating effects, all the four theories explain the combined effect of supply chain integration, competitive advantage and environmental dynamism on performance. The main argument of the resource-based perspective is that competitive advantage can be sustained if an organisation owns resources that are rare, non-substitutable, valuable and imperfectly imitable (Barney, 1991; Halldórsson et al., 2015). However, that a firm has these resources is no guarantee to competitiveness. It is the capability and decision-making process of an entity's management to organise and deploy

these resources in an inimitable manner that is key to competitiveness (Boon-Itt & Wong, 2011; Thoo et al., 2017). To achieve this internally, Fawcett et al. (2007) argue that it entails breaking down functional silos, sharing information across functions and deploying cross-functional teams.

The basic premise of resource-dependence theory (RDT) is that virtually all organisations are dependent on one another for access to crucial resources and that this dependence is also mutual (Drees & Heugens, 2013). Pfeffer and Salancik (2003) argue that organisations which were formally independent engage in such inter-firm arrangements as joint ventures, board interlocks, acquisitions and mergers, alliances, among others. The major objective of resource dependence theory is therefore to reduce uncertainty in the organisation's environment.

Systems theory considers the supply chain as a complex adaptive system (Carter et al., 2015). It challenges the view that organisations are static and proposes an open systems perspective, positing that organisations at organisational, group and/or individual level are influenced by time and environmental factors (Lavassani & Movahedi, 2010); that a dynamic system changes the environment constantly and is also changed by the environment (Holweg, 2001). New and Westbrook (2004) argue that feedback (system concept of entropy) is a necessity across the whole supply chain to prevent decay or debilitation of the system.

Koufteros et al. (2005) found a non-significant combined effect of integration of supply chain, competitive advantage and environmental dynamism on organisational performance. A study by Chi et al. (2009) examining the combined effect of supply chain structures, competitive priorities and business environment characteristics on business performance had two contexts: high and low performing firms. The effect was negative for high performers while there was no effect for low performers. From these studies, there are knowledge gaps. Firstly, the results are inconsistent. Also, the variables used are different from what this study used. This study therefore proposed that the combined effect of supply chain integration implementation, competitive advantage and environmental dynamism on performance is positive and significant.

Conceptual Framework

Supply chain integration is the study's exogenous construct, and it is made up of three indicators, as stated in the previous sections. These are customer, internal, and supplier integrations. Firm performance, as assessed by operating income and total assets, staff motivation, and customer satisfaction, is the response variable. It is proposed that competitive advantage mediates the role of supply chain integration implementation on company performance. Price/cost, quality, speed, dependability and flexibility are the indicators of competitive advantage. Finally, it is hypothesised that environmental dynamism (as measured by supplier uncertainty, customer demand, competitive intensity, technological uncertainty and government policy) moderates the effect of integration of supply chain on performance. The proposed relationships are schematically outlined in **Figure 1** below.

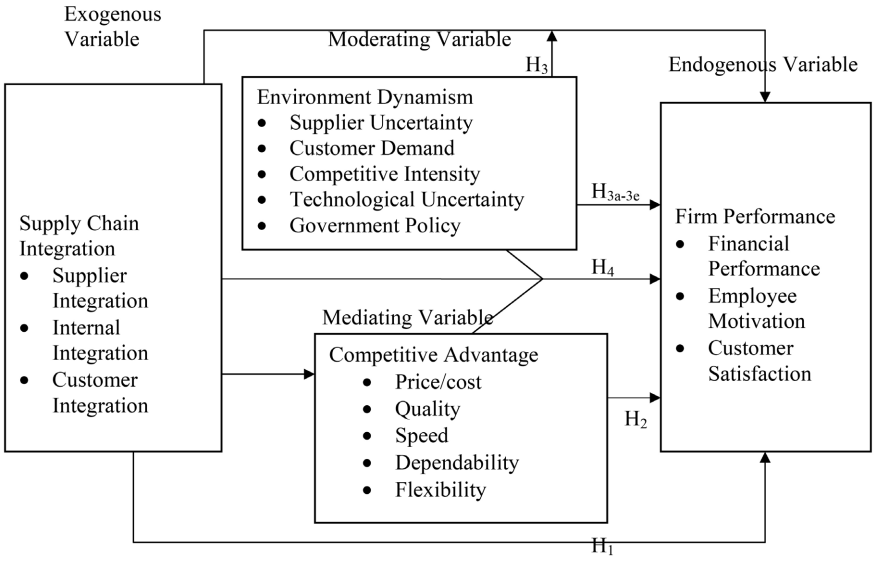

Figure 1. Conceptual model. Source: Researcher (2023).

3. Research Methodology

In social science research, two philosophical approaches are dominant; interpretivism and positivism. Interpretivism views reality as socially constructed, hence it is alternatively called social constructivism (Saunders et al., 2003). Interpretivism considers reality as being established by people as opposed to by objective and external factors (Easterby-Smith et al., 2002; Irshaidat, 2022). This perspective portends that the researcher and reality are inseparable; hence studies using interpretivism are inductive in nature. These studies tend to be qualitative due to their subjective nature and are evaluated by their ability to discover new themes and explanations rather than generalization (Saunders et al., 2009).

Positivism approach assumes that reality is external and objective. As Remenyi et al. (1998) put it, "the researcher is independent of and neither affects nor is affected by the subject of research". Hence, a study ought to be explained by value free objective criteria as opposed to human interests and beliefs (Kulatunga et al., 2007). Studies adopting this approach are deductive and designed to test hypotheses that are developed from literature (Crowther & Lancaster, 2008). These studies also tend to be quantitative (Easterby-Smith et al., 2002). This research was premised on a positivist research philosophy, since it is deductive rather than inductive. Also, research hypotheses developed from literature tested the relationship between variables using quantitative data.

3.1. Population of the Study

Large manufacturing companies in Kenya formed the population of this research. The research adopted the KAM classification that considered a large manufacturing firm to have one hundred employees or more. According to Kenya Manufacturers and Exporters Directory—Online Directory (2019), there were 679 such firms. The major rationale for choosing large scale manufacturing

firms is that they have a high likelihood of exhibiting an elaborate SCM strategy and practice of supply chain integration (Bolo, 2011). This is because they are likely to have existed for a longer period relative to the smaller ones and have experimented with various management styles.

3.2. Sampling Techniques

The sampling frame for the research was the list of large-scale manufacturing firms in Kenya (Bolo, 2011). This study used Structural Equation Modelling (SEM) in analysing the data. There are various approaches for sample size determination using SEM such as the highest number of arrows directed at a latent variable (Marcoulides & Saunders, 2006) and use of N: q ratio where N is number of cases while q is number of parameters in the model. Hair et al. (2014a) recommend the use of N: q ratio as it results in the larger sample size. This is the approach used in the study. Jackson (2003) avers that the ideal ratio should be 20:1.

This study has six parameters and hence the sample size shall be $20 \times 6 = 120$. Israel (1992) asserts that on average 10% of respondents cannot be reached while 30% may not respond. Hence, to achieve a usable sample size of 120, the number of firms targeted was 120 divided by 0.6 which results in 200. Proportionate sampling approach was applied to obtain the sample size from the various strata. Within each stratum, systematic random sampling was used to pick the specific study firms since there was low risk of data manipulation (Maduekwe & de Vries, 2019). Primary data was applied in this study and it was gathered by means of a structured questionnaire.

3.3. Data Analysis

This study applied PLS-SEM to analyse the data. Wong (2013) describes PLS-SEM as a soft modelling approach which makes no assumptions on the distribution of the data. The technique is the best alternative to covariance-based Structural Equation Model (SEM) when dealing with a relatively small sample size and yet the model is complex; where normality requirement is not met, if the study is not confirmatory but exploratory and when the main aim of the model is prediction (Kaufmann & Gaeckler, 2015; Sarstedt et al., 2017). Furthermore, an advantage of SEM over regression analysis is that several analyses such as reliability, validity and hypothesis testing can be conducted (Hair et al., 2007). In this study, the four objectives can be realized using the technique. Also, the PLS-SEM is deemed relevant for this research since the sample size of 200 is comparatively low for covariance-based SEM. This technique has been employed successfully by Oredo (2016) who had sample size of 93 and Odock (2016) with sample size of 67.

3.4. Reliability and Validity Tests

Reliability and validity tests were used to ensure the study's results were credible. The indicator's precision, consistency, and repeatability are determined by its re-

liability (Huck et al., 2012). Internal consistency reliability tests for each item and concept in the study were conducted using Jorestkogs composite reliability statistics and Cronbach's Alpha coefficient. Only items and constructs with Cronbach's Alpha values of 0.7 and above were considered for further analysis provided content validity was not compromised (Hair et al., 2007). Composite reliability was established if the score is greater than 0.6 (Hair et al., 2011). Likewise, principal component analysis was conducted to assess the reliability of the measurement scale. Byrne (2001) avers that for an item to be part of the latent construct, its variance must be at least 0.3. To measure the convergent validity of the model, average variance extracted (AVE) values and confirmatory factor analysis were used. This was established if AVE is greater than 0.5 (Peng & Lai, 2012). Moreover, confirmatory factor analysis is established if indicators of a particular latent variable loaded more heavily on their constructs than on any other construct.

Validity is the degree to which an instrument measures what it is supposed to measure (Sekaran & Bougie, 2016). For content validity, the questionnaire was pretested on 10 experts who manage the supply chains of the study firms. This was to check on issues like wording, logic and content of the questionnaire (Hair et al., 2014b). Construct validity refers to whether a measure correlates with the theorised latent construct that it purports to measure (Zeng et al., 2010). This was assessed using exploratory factor analysis (EFA) with varimax rotation. Items with factor loading less than 0.4 were not considered for further analysis. Next, construct validity was determined by examining convergent and discriminant validity. For convergent validity to be established, a minimum outer loading of 0.7 is required for an indicator (Hair et al., 2021). For a construct, convergent validity is established if AVE $\geq$ 0.5.

Three criteria were used to evaluate discriminant validity; cross loadings, Fornell-Larcker criterion and HTMT ratio. For cross loadings, it is established if every item loads highest on its related latent variable compared to on any other latent variable. For Fornell-Larcker criterion, the square root of AVE for a given latent variable has to be larger than other correlations in the columns and rows (Fornell & Larcker, 1981). Heterotrait-Monotrait, HTMT statistic was also used to assess discriminant validity (Hair et al., 2021). Discriminant validity was confirmed if HTMT $\leq$ 0.85 and its confidence interval excludes 1. The structural model was tested for collinearity among the constructs. If the tolerance level is more than 0.2 and Variance Inflation Factor (VIF) is less than 5, there is no multicollinearity.

4. Research Findings

Out of 200 questionnaires administered to the research participants, 111 were obtained. This represents a response proportion of 55.5%. A response proportion of 70% is excellent, 60% is good and 50% is adequate for the study as argued by Mugenda and Mugenda (2003). However, other researches have indicated that outcomes from studies with rate of response of 20 percent or even lower

were not any statistically significant compared to those of larger response rate (Curtin et al., 2000; Keeter et al., 2006). A detailed analysis of the questionnaires found that 17 of them were not useful for further study (8 had inconsistent responses, 5 had straight lining responses, 3 were not fully filled and 1 indicated more than one sector). Therefore, the useful questionnaires were 94 which represent a revised response rate of 47%.

Sampling adequacy and sphericity tests to assess whether factor analysis is suitable were carried out. To assess sampling adequacy, Kaiser-Meyer-Olkin (KMO) measures were used. According to Kaiser (1974), KMO values < 0.5 are not acceptable. Bartlett's test of sphericity is used to assess for dimension reduction. This is possible if p values < 0.05. All KMO measures were established to be more than the required minimum and their p values were <0.05. This indicates that all constructs are significant statistically.

The scales' Cronbach's Alpha for variables of supply chain integration, competitive advantage, environmental dynamism and firm performance were above 0.7 except supplier uncertainty, customer uncertainty, competitive intensity, technical uncertainty and financial performance but were retained due to content validity. Hence, internal consistency is confirmed. **Table 1** displays the outcomes.

Additionally, confirmatory factor analysis was done. The results are presented

Table 1. Cronbach's alpha test outcomes for measuring internal reliability of questionnaire item for SCI, CA, ED and FP.

Latent Variable	Cronbach's Alpha
Supplier Integration	0.783
Internal Integration	0.848
Customer Integration	0.857
Cost	0.773
Quality	0.863
Speed	0.771
Dependability	0.708
Flexibility	0.930
Supplier Uncertainty	0.647
Customer Uncertainty	0.574
Competitive Intensity	0.617
Technological Uncertainty	0.610
Government Policy	0.765
Financial Performance	0.687
Employee Motivation	0.820
Customer Satisfaction	0.756

Source: Researcher (2023).

in Table 2. It can be observed that the respective indicators of a particular latent variable loaded more heavily on their constructs than on any other construct. This therefore, implies that unidimensionality of the constructs is established.

Table 3 exhibits the results for the outer model loadings. The indicator reliability levels are all above the threshold of 0.4 except for competitive intensity, technological uncertainty and financial performance which are marginally below (0.352, 0.391 and 0.384 respectively). However, their outer loadings are above the acceptable level of between 0.4 and 0.7 (Hair et al., 2021). The T values are also all significant since they are above the critical value of 1.96 and *p*-values are all lower than the maximum required of 0.05. Thus, all these constructs were retained for further analyses.

Cronbach's Alpha and Composite reliability tests were carried out to assess internal consistency reliability. The Cronbach's Alpha values are all above the acceptable level of 0.5 while the composite reliability levels are all larger than the required minimum value of 0.7; hence all the latent variables were retained for further analysis. Table 4 exhibits the outcomes.

Table 2. Confirmatory factor analysis results for all indicators and constructs.

Indicator	Supply Chain Integration	Competitive Advantage	Environmental Dynamism	Firm Performance
Supplier Integration	**0.742**	0.298	0.170	0.264
Internal Integration	**0.900**	0.410	0.184	0.486
Customer Integration	**0.906**	0.508	0.329	0.557
Cost	0.477	**0.833**	0.340	0.399
Quality	0.156	**0.664**	0.223	0.167
Speed	0.346	**0.825**	0.261	0.316
Dependability	0.263	**0.779**	0.243	0.330
Flexibility	0.505	**0.812**	0.255	0.495
Supplier Uncertainty	0.209	0.290	**0.806**	0.239
Customer Uncertainty	0.214	0.268	**0.674**	0.191
Competitive Intensity	0.069	0.212	**0.593**	0.078
Technological Uncertainty	0.263	0.275	**0.625**	0.141
Government Policy	0.144	0.091	**0.647**	0.159
Financial Performance	0.284	0.428	0.245	**0.620**
Employee Motivation	0.463	0.351	0.207	**0.877**
Customer Satisfaction	0.475	0.305	0.143	**0.777**

Source: Research data (2023).

Table 3. Outer mode loadings results.

Latent Variable	Outer Loading	Indicator Reliability	*t*-Value	*p*-Value
Supplier Integration	0.742	0.551	11.793	0.000
Internal Integration	0.900	0.810	34.004	0.000
Customer Integration	0.906	0.821	41.380	0.000
Cost	0.833	0.694	27.045	0.000
Quality	0.664	0.441	6.462	0.000
Speed	0.825	0.681	14.915	0.000
Dependability	0.779	0.607	9.983	0.000
Flexibility	0.812	0.659	24.611	0.000
Supplier Uncertainty	0.806	0.650	6.482	0.000
Customer Uncertainty	0.674	0.454	4.573	0.000
Competitive Intensity	0.593	0.352	3.721	0.000
Technological Uncertainty	0.625	0.391	4.341	0.000
Government Policy	0.647	0.419	4.135	0.000
Moderating Effect	0.845	0.714	13.472	0.000
Financial Performance	0.620	0.384	4.337	0.000
Employee Motivation	0.877	0.769	18.687	0.000
Customer Satisfaction	0.777	0.604	10.955	0.000

Source: Research data (2023).

Table 4. Cronbach's alpha, composite reliability and AVE results.

Latent Variable	Cronbach's Alpha	Composite Reliability	AVE
Supply Chain Integration	0.817	0.888	0.727
Competitive Advantage	0.852	0.889	0.616
Environmental Dynamism	0.708	0.804	0.453
Moderating Effect	1.000	1.000	1.000
Firm Performance	0.631	0.806	0.586

Source: Research data (2023).

AVE and CFA were used to test convergent validity. **Table 4** reveals that the AVE values are all larger than the minimum required level of 0.5 except for environmental dynamism which is marginally below at 0.453. However, all will be retained on the basis of composite reliability which are all greater than the required minimum level of 0.7 (Hulland, 1999). It can also be noted from **Table 5** that the cross-loadings of indicator latent variables to their respective constructs are larger than for any other construct (shown in bold). This further confirms convergent validity.

Table 5. Confirmatory factor analysis.

Indicator	Competitive Advantage	Environmental Dynamism	Firm Performance	Moderating Effect	Supply Chain Integration
Cost	**0.833**	0.340	0.399	−0.145	0.477
Quality	**0.664**	0.223	0.167	−0.027	0.156
Speed	**0.825**	0.261	0.316	0.002	0.346
Dependability	**0.779**	0.243	0.330	−0.121	0.263
Flexibility	**0.812**	0.255	0.495	0.003	0.505
Supplier Uncertainty	0.290	**0.806**	0.239	0.255	0.209
Customer Uncertainty	0.268	**0.674**	0.191	0.186	0.214
Competitive Intensity	0.212	**0.593**	0.078	0.490	0.069
Technological Uncertainty	0.275	**0.625**	0.141	0.208	0.263
Government Policy	0.091	**0.647**	0.159	0.336	0.144
Financial Performance	0.428	0.245	**0.620**	−0.111	0.284
Employee Motivation	0.351	0.207	**0.877**	−0.276	0.463
Customer Satisfaction	0.305	0.143	**0.777**	−0.146	0.475
Moderating Effect	−0.073	0.389	−0.238	**1.000**	−0.218
Supplier Integration	0.298	0.170	0.264	−0.071	**0.742**
Internal Integration	0.410	0.184	0.486	−0.266	**0.900**
Customer Integration	0.508	0.329	0.557	−0.187	**0.906**

Source: Research data (2023).

Discriminant validity was assessed using three criteria; Fornell-Larcker criterion, cross-loadings of latent variable scores and HTMT ratio. Table 6 exhibits the Fornell-Larcker test results.

The AVE for competitive advantage is 0.616 (Table 4) and its square root is 0.785 (Table 6). This figure is bigger than the other correlation values in its column (0.341, 0.472, −0.073 and 0.491). Similarly, the AVE for environmental dynamism is 0.453 (Table 4) and its square root is 0.673 (Table 6). This value is

bigger than the correlation value in the row (0.341) and in the column (0.259, 0.389 and 0.279). Also, the AVE for firm performance is 0.586 (Table 4) and its square root is 0.766 (Table 6). This figure is bigger than the correlation values in the row (0.472 and 0.259) and in the column (−0.238 and 0.538). The AVE for moderating effect is 1.000 (Table 4) and its square root is 1.000 (Table 6). This figure is bigger than the correlation values in the row (−0.073, 0.389 and −0.238) and in the column (−0.218). The AVE for supply chain integration is 0.727 (Table 4) and its square root is 0.853 (Table 6). This figure is higher than the correlation values in the row (0.491, 0.279, 0.538, and −0.218). Hence on the basis of Fornell-Larcker test, discriminant validity is affirmed. Further, the HTMT ratios were all lower than the maximum required of 0.85. This further confirms discriminant validity. Table 7 displays the outcomes.

Collinearity was evaluated for the outer model using VIF and tolerance values. The results are presented in Table 8. As can be observed, the tolerance levels are higher than 0.2 and the VIF levels are lower than the threshold of 5. This confirms that there is no multicollinearity in the outer model.

Table 6. Fornell-Larcker criterion analysis results.

Latent Construct	Competitive Advantage	Environmental Dynamism	Firm Performance	Moderating Effect	Supply Chain Integration
Competitive Advantage	**0.785**				
Environmental Dynamism	0.341	**0.673**			
Firm Performance	0.472	0.259	**0.766**		
Moderating Effect	−0.073	0.389	−0.238	**1.000**	
Supply Chain Integration	0.491	0.279	0.538	−0.218	**0.853**

Source: Research data (2023).

Table 7. HTMT outcomes.

	HTMT Ratios
Supply Chain Integration > Competitive Advantage	0.505
Competitive Advantage > Firm Performance	0.594
Moderating Effect > Firm Performance	0.295
Supply Chain Integration > Firm Performance	0.709
Environmental Dynamism > Firm Performance	0.366

Source: Research data (2023).

Table 8. Tolerance and variance inflation factor statistics for the outer model.

	Tolerance	VIF
Cost	0.529	1.890
Quality	0.505	1.980
Speed	0.471	2.122
Dependability	0.457	2.188
Flexibility	0.576	1.737
Supplier Uncertainty	0.701	1.426
Customer Uncertainty	0.824	1.214
Competitive Intensity	0.749	1.335
Technological Uncertainty	0.792	1.262
Government Policy	0.796	1.257
Financial Performance	0.874	1.144
Employee Motivation	0.526	1.900
Customer Satisfaction	0.584	1.712
Moderating Effect	1.000	1.000
Supplier Integration	0.644	1.553
Internal Integration	0.443	2.255
Customer Integration	0.488	2.048

Source: Research data (2023).

The collinearity statistics for the inner model are displayed in Table 9. As can be observed, all the tolerance levels are greater than the minimum required of 0.2 and the VIF values are below 5. This confirms that there is no collinearity in the inner model.

A q^2 value of 0.35, 0.15, or 0.02 for predictive relevance indicates that an exogeneous latent variable has a significant, moderate or small predictive relevance for a given endogenous latent variable, in that order (Peng & Lai, 2012). The predictive relevance for the applicable endogenous variable in the model (firm performance) was $Q^2 = 0.188$. This is bigger than the minimum required value of zero; hence model's predictive relevance is acceptable. The outcomes are exhibited in Figure 2.

The q^2 values for supply chain integration, competitive advantage, environmental dynamism and moderating effect are 0.091, 0.017, 0.004 and 0.005 respectively. All these values have small predictive relevance effect. Table 10 displays the outcomes.

The overall model was assessed for goodness of fit using SRMR statistic and its statistical significance. The SRMR value was found to be 0.102 which is marginally above the threshold of less than 0.1. In any case, all the SRMR path

Table 9. Tolerance and variance inflation factors for the inner model.

	Tolerance	VIF
Competitive Advantage – Firm Performance	0.708	1.413
Environmental Dynamism – Firm Performance	0.663	1.508
Moderating Effect – Firm Performance	0.727	1.376
Supply Chain Integration – Competitive Advantage	1.000	1.000
Supply Chain Integration – Firm Performance	0.676	1.480

Source: Research data (2023).

Table 10. Summary of q^2 values.

Latent Variable	q^2 Value
Supply Chain Integration	0.091
Competitive Advantage	0.017
Environmental Dynamism	0.004
Moderating Effect	0.005

Source: Research data (2023).

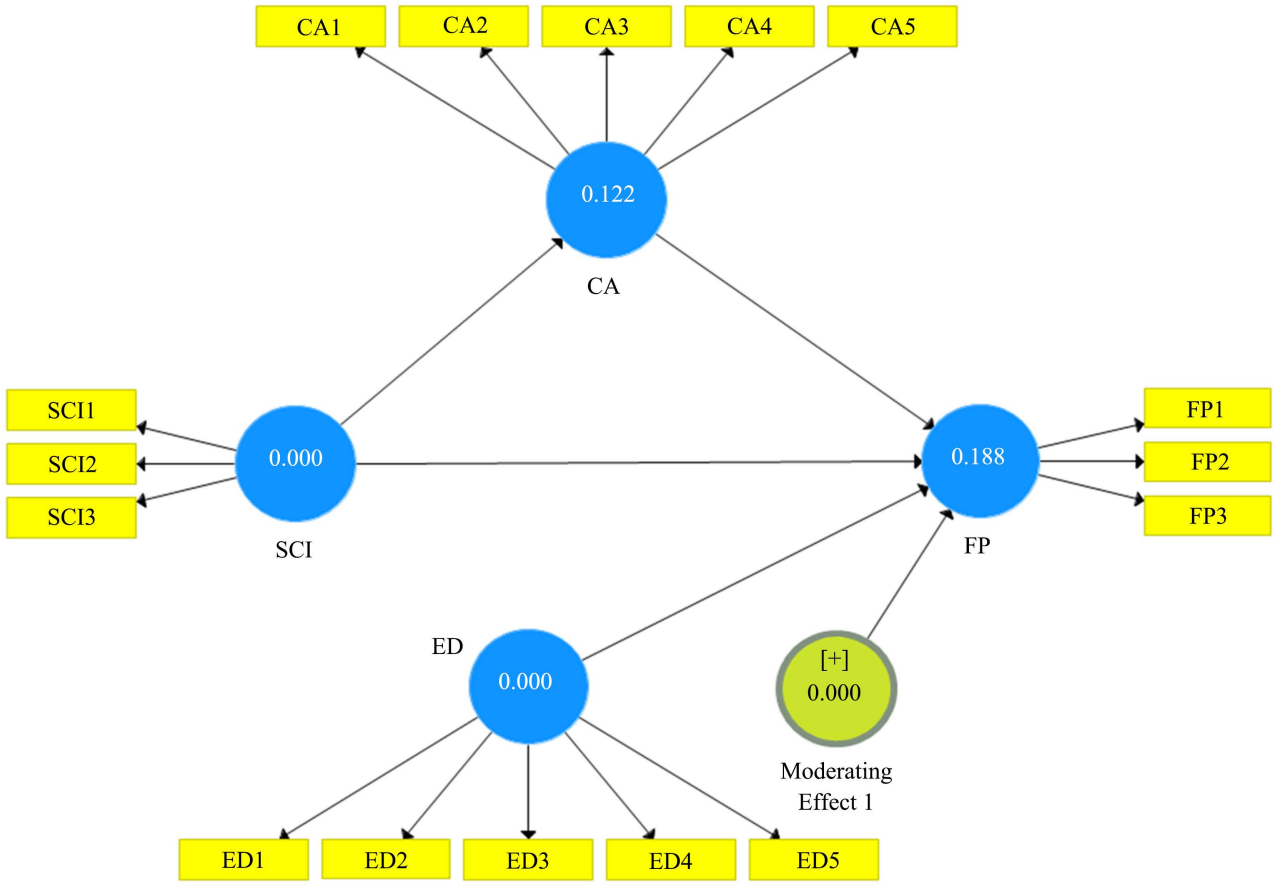

Figure 2. Q^2 value.

coefficients are catechistically significant except for ED > FP but which is represented by the moderating effect. Hence, model fit is established. Statistical significance outcomes are displayed in Table 11.

The coefficient of determination, R^2, for the relevant endogenous variable (firm performance) in the model and the effect size, f^2 are shown in Figure 3. The value for R^2 is 38.3%. This implies that the variance in the combined exogenous latent variables explain 38.3 percent of the variation in the endogenous

Table 11. Composite model SRMR results.

	Original Sample	Sample Mean	Standard Error	*t* Statistic	*p* Value
CA > FP	0.237	0.232	0.113	2.092	0.037
ED > FP	0.171	0.207	0.109	1.573	0.116
Moderating	−0.255	−0.228	0.119	2.144	0.032
SCI > CA	0.491	0.508	0.071	6.954	0.000
SCI > FP	0.326	0.337	0.100	3.255	0.001

Source: Research data (2023).

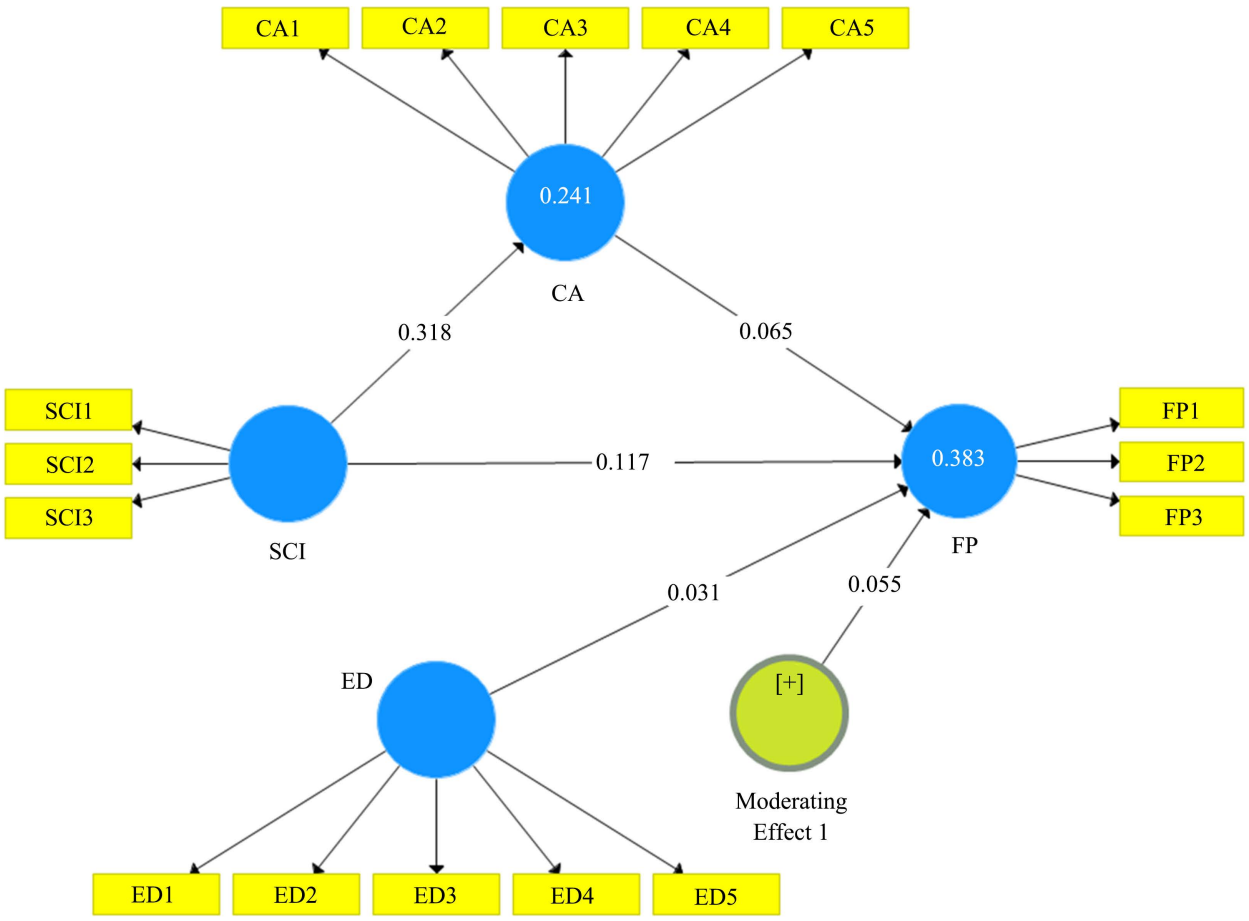

Figure 3. R^2 and f^2 values.

variable (firm performance). According to Peng and Lai (2012) this is a moderate explained variance. The R^2 value for the direct link connecting supply chain integration to organizational performance is 30.0%. The mediating effect model was found to be 34.6% while that for the moderating effect model was found to be 35.0%. It can therefore be observed that the combined effect model R^2 is the largest among all models as expected. The outcomes are displayed in Table 12 and Figure 3.

The f^2 value for supply chain integration is 0.117 which falls in the range of medium effect. The values for competitive advantage, environmental dynamism and moderating effect are 0.065, 0.031 and 0.055 respectively. These all fall in the range of small effect.

Table 13 exhibits the findings.

It can be observed that the path coefficients of the combined effect model are all significant except for the path of environmental dynamism to firm performance as illustrated in Figure 4 and Figure 5. However, environmental dynamism is represented by the moderating effect latent variable in the model. Hence, it is to be inferred that supply chain integration, competitive advantage and environmental dynamism have a significant combined effect on firm performance.

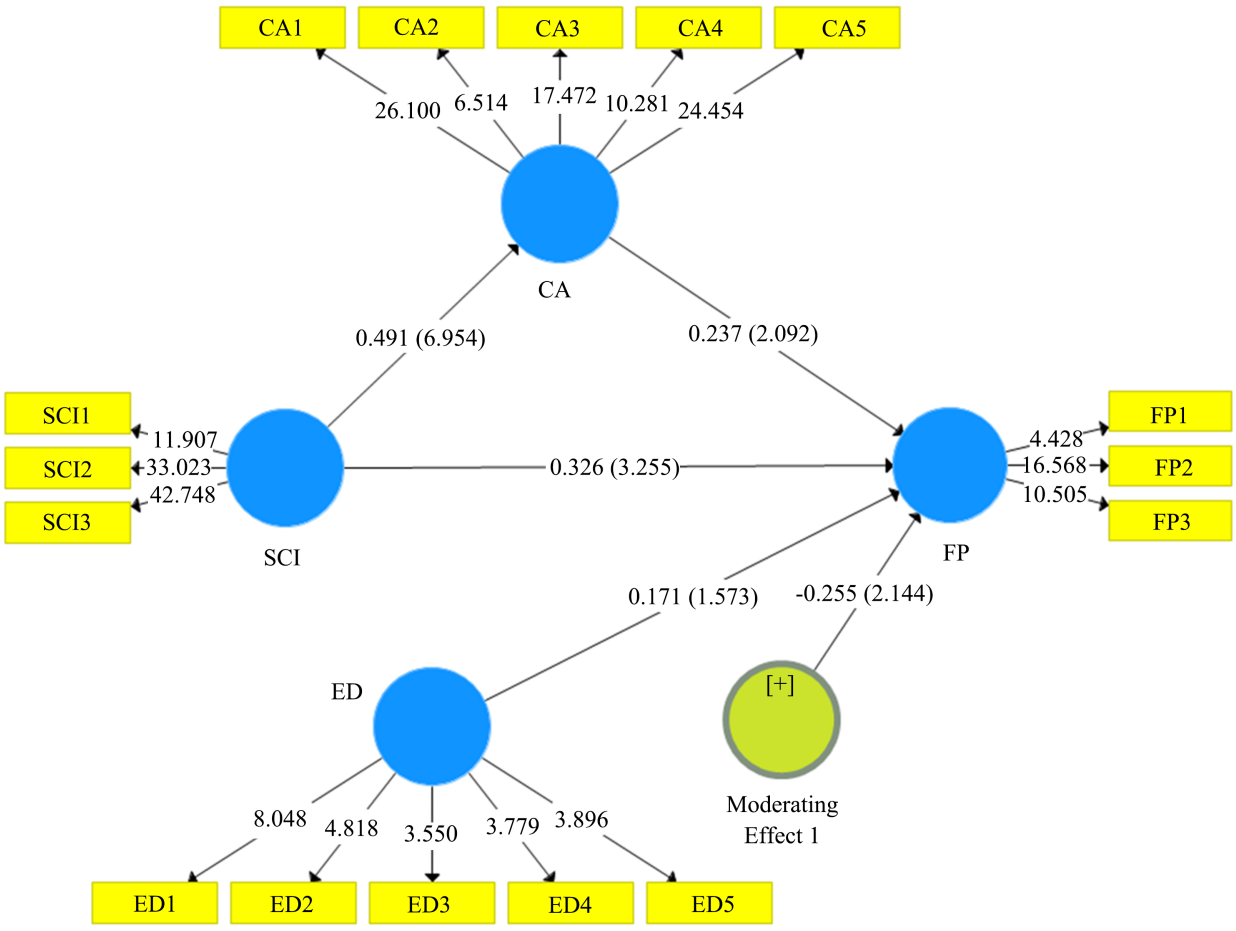

Figure 4. Combined effect model having path coefficient and *t*-values.

Table 12. Summary of R^2 values of the various effects.

Effects	R^2 Value
Direct Effect	30.0%
Mediating Effect	34.6%
Moderating Effect	35.0%
Combined Effect	38.3%

Source: Research data (2023).

Table 13. f^2 values.

Latent Variable	f^2	Inference
Supply Chain Integration	0.117	Medium
Competitive Advantage	0.065	Small
Environmental Dynamism	0.031	Small
Moderating Effect	0.055	Small

Source: Research data (2023).

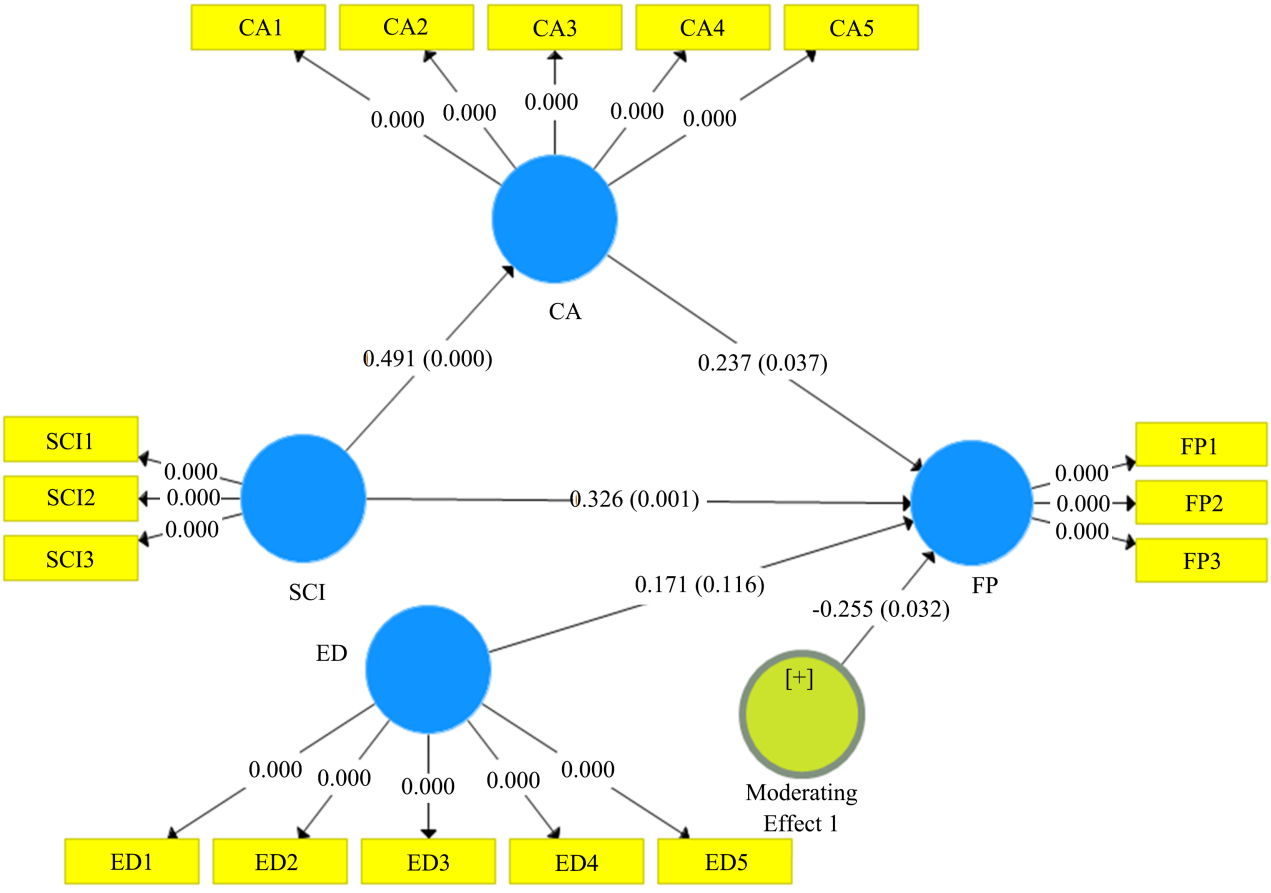

Figure 5. Combined effect diagram having path coefficient and *p*-values.

4.1. Discussion of the Findings

This research was to determine the combined effect of supply chain integration, competitive advantage and environmental dynamism on performance of the firm. A structural model integrating these four latent variables was developed and tested. All the path coefficients of the model were found to be statistically significant. This was not unexpected since the direct connection linking supply chain integration implementation to organizational performance, the mediating influence of competitive advantage on the connection linking supply chain integration to company performance and the moderating influence of environmental dynamism on the connection linking supply chain integration implementation to organizational performance were all found to be significant.

This is in congruence with the finding by Zhang et al. (2017) although this study did not have competitive advantage as a variable. It also concurs with that of Arifin and Baihaqi (2012). The finding also resolves the results of some researchers such as Koufteros et al. (2005) who found a non-significant combined effect of supply chain integration, competitive advantage and environmental dynamism on organisational performance. It is to be noted that studies on the combined influence of integration of supply chain, competitive advantage and environmental dynamism on organizational performance are quite scarce. This study therefore provides a significant contribution in this regard.

4.2. Conclusion

A key conclusion of this research is that if a firm implements supplier, internal and customer integrations, it will enhance its firm performance through improved financial performance, increased employee motivation and greater customer satisfaction (Koufteros et al., 2014).

A second conclusion of the study is that supply chain integration results in enhanced competitive advantage. This is through lower product pricing relative to the competition and higher quality products. Competitive advantage also results in lower lead-times and delivery of products/services to the customer the way they expected. It also leads to the capability of the company to respond to fluctuations in the volume of production, time to market, the product mix and introduction of new products at short notice (Ploenhad et al., 2019; Shakkya, 2013; Zubir & Sundram, 2014).

A third conclusion of the study is that competitive advantage leads to enhanced firm performance through improved financial performance, increased employee motivation and customer satisfaction. If a firm is able to price its products lower in the market (due to low production cost) and is able to deliver its products faster, then customer satisfaction will be enhanced (Vencataya et al., 2016).

A final conclusion of the study is that as the degree of environmental dynamism increases, the strength of the connection linking supply chain integration implementation to organizational performance is also expected to increase. This

means that in highly dynamic environments, firms tend to forge closer alliances with their suppliers and customers in order to mitigate the negative consequences of the uncertainty (Kamasak et al., 2016; Fynes et al., 2004).

4.3. Implications of the Study

A major contribution to knowledge of this study is that implementation of supply chain integration results in enhanced performance of the firm. Effectively this finding complements the pool of knowledge on positive link connecting supply chain integration implementation to firm performance as supported by theory and empirical findings (Koufteros et al., 2014; Aduku & Ayertey, 2015; Subburaj et al., 2020).

Another contribution of this study is that it used the balanced scorecard approach to measure performance as advocated by Kaplan and Norton (1992). The study used customer, financial, internal and employee dimensions which are considered superior to traditional-based financial measures since it seeks to complement financial measures of historical performance (Bhagwat & Sharma, 2007).

Also, a contribution of this study is that it considered competitive advantage as a mediating factor on the connection linking integration of the supply chain to company performance. This is in congruence with recommendations of past researchers on the need to explore mediating variables that could bring out the connection linking supply chain integration to firm performance fully (Zubir & Sundram, 2014; Vencataya et al., 2016). The findings were that competitive advantages positively but partially mediate the link connecting supply chain integration implementation to company performance. This means that supply chain integration implementation leads to competitive advantage and this subsequently results in enhanced firm performance. This adds to findings by past researchers (Reklitis et al., 2021; Dikshit & Trivedi, 2012; Akmal et al., 2018; Baah & Jin, 2019). This study therefore helps to settle the debate on the mediating influence of competitive advantage on the connection linking supply chain integration to company performance.

A further contribution of this study is that it considered moderating influence of environmental dynamism on the connection linking supply chain integration implementation to organizational performance. This is consistent with arguments by various researchers (Lee et al., 2016) on the need to explore the role of moderating variables in order to bring out fully the connection linking supply chain integration to company performance. The findings show that environmental dynamism is a significant moderating factor on the relationship, which is in congruence with the outcomes of past scholars (Huang et al., 2014; Srinivasan et al., 2011). The finding therefore adds to the debate on the moderating role of environmental dynamism on the connection linking supply chain integration implementation to firm performance. This is a further addition to the literature on the individual moderating roles of these dimensions of environmental dynamism.

Finally and crucially, the findings also advance the supply chain integration, competitive advantage, environmental dynamism and performance relationship studies in the context of a developing country, Kenya. Supply chain integration is a comparatively new management phenomenon in this part of the world as most of the studies have been done in Europe, the Americas and Asia where most economies are developed. Hence it is expected that the outcomes of this research will encourage firms to take up supply chain integration practices in this region.

4.4. Limitations

The variables in the study were measured by use of perceptual data which tend to change over time and among different respondents. Future researchers should consider the use of objective data which are expected to bring out the relationships among the variables in the model more clearly and accurately. Future research should also be carried out in contexts other than large manufacturing firms. This research could be replicated in small manufacturing firms and in other sectors different from manufacturing and in particular in the service sector where there are few studies. The research could also be done in different parts of the world other than Kenya considering that they would have different cultural backgrounds.

4.5. Recommendations for Further Research

This study had a low response rate which necessitated the use of PLS-SEM as data analysis method. Future researchers should strive to have higher response rates to enable the use of more robust techniques such as covariance-based SEM in data analysis.

The variables in the study were measured by use of perceptual data which tend to change over time and among different respondents. Future researchers should consider the use of objective data which are expected to bring out the relationships among the variables in the model more clearly and accurately.

As already noted, this is one of very scanty studies which had uncertainty in government policy as a variable. More studies are therefore called for which have it as a variable particularly in countries or economies with weak institutional setups.

Finally, given that the study was carried out in a medium level of environmental dynamism, it is suggested that future researches are carried out in environments with low and also with high levels of environmental dynamism.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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