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The Moderating Effect of Collaborative Capability on Supplier Integration and Performance of Cement Manufacturing Firms in Kenya

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Abstract

Currently, there is a debate about the performance of cement manufacturing firms. The main objective of this research study was to determine the moderating effect of collaborative capability on the relationship between supplier integration and performance of cement manufacturing firms in Kenya. The study used a descriptive survey research design, with a target population comprising 450 managers from supply chain sections or departments in cement manufacturing firms registered with the Kenya Association of Manufacturers. The study obtained a sample of 212 respondents using stratified sampling by cement manufacturing firms, followed by proportionate allocation, and then simple random sampling within each stratum. Data were collected using a self-administered questionnaire, piloted with 21 respondents from three Cement manufacturing firms. The research study used both descriptive and inferential statistics to analyze the collected data. Furthermore, bivariate correlation and linear regression analyses were used to test the degree of association (correlations) between supplier integration and firm performance. In addition, hierarchical and stepwise regression analyses were conducted to determine the moderating effect of collaborative capability on the relationship between supplier integration and performance of cement manufacturing firms in Kenya. Based on the results, supplier integration is positively and significantly correlated with the performance of cement manufacturing firms in Kenya. Furthermore, the findings revealed that collaborative capability significantly moderates the relationship between supplier integration and firm performance. Therefore, the recommendations of this research study are that cement manufacturing firms in Kenya should continue to be deliberate in their supplier integration practices and even create collaborative environments to enhance the relationship between supplier integration practices and cement manufacturing firms' performance in Kenya.

Keywords: *Supplier Integration, Collaborative Capability, Performance of Cement Manufacturing Firms in Kenya*

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1. Introduction

It has generally been acknowledged that Supply Chain Integration (SCI) practices, such as supplier integration, are very important in achieving both the firm's performance and its competitive advantage (Rosa & Reza, 2020; Hamid, 2020; Huo, Qi, Wang & Zhao, 2015). However, Hamid (2020) opines that many obstacles to supply chain management, such as supplier integration, ultimately affect the organization's overall performance. Accordingly, certain regulations and associations that delay supplier selection tend to affect the performance of many organizations. Consequently, this delay led to products and services not being delivered to customers at the right place and right time, and hence the loss of competitive advantage. Nonetheless, Kariuki and Nafula (2020) noted that cement manufacturing organizations in Kenya face challenges related to competition from imports and operational efficiency.

Cement manufacturing firms in Kenya also face challenges, among them competition from imports and operational inefficiencies in the industry. Other challenges include high electricity costs that are sometimes in short supply and expensive due to high tariffs imposed, high fuel costs, and high coal costs, which must be imported and are subject to taxes (Murunga, 2016). In light of competition and other challenges faced by cement-manufacturing firms in Kenya, these firms have implemented various strategies, such as innovation to pursue efficiency and effectiveness (Chesaro, 2013; Kenani, 2013).

Most of the studies that have addressed the operational performance in general have focused on the manufacturing companies, production companies, and the pharmaceutical sector, where these studies neglected service companies (Medical Sector), which represent a true foundation of the national economy, playing an active role in economic and social growth by providing and diversifying services, achieving developmental goals, and creating job opportunities. Therefore, this research focuses on operational performance in the cement manufacturing sector, VBF, an area that previous studies have failed to address. Thus, this study will explore the relationship between supply chain integration and cement manufacturing performance in Kenya.

1.1 Problem Statement

The performance of cement manufacturing firms in Kenya reveals significant gaps stemming from underutilized capacity, declining production, and persistent supply chain inefficiencies. In 2024, cement sales dropped by 8% to 8.47 million tonnes, the sharpest decline in over two decades, while production decreased by 12.1% in Q3 alone (Global Cement, 2024; KNBS, 2024). Capacity utilization hovered around 62.2%, highlighting idle production capabilities despite existing infrastructure (CCF2UP, 2024). Thus, despite the cement manufacturing sector accounting for a notable portion of Kenya’s GDP and employment, it has been experiencing stagnation and slow growth, with an average annual growth rate of only 7.7% in recent years (KIPPRA, 2022). In addition, prominent cement manufacturing companies, such as Athi River Mining and East African Portland Cement Plc, have experienced a decline, transitioning from industry leaders to loss-making firms within a decade (KNBS, 2024; Mwakilishi, 2024; Kitainge, Bor, & Wanza, 2019). These challenges are exacerbated by fluctuating demand, poor logistics infrastructure, unreliable energy supply, and the proliferation of low-quality cement due to inadequate quality control (KNBS, 2024; Mwakilishi, 2024). Unlike the ideal supply chain environment characterized by digital integration and real-time coordination (Rudberg &

Olhager, 2022; Cooper & Gardner, 2023), Kenyan firms lack visibility and responsiveness across the value chain, hence the use of SCI practices such as customer integration to help the industry improve performance and remain competitive as well as meet the growing market demands (Chopra & Meindl, 2017).

Empirical research reveals significant gaps in understanding and implementing real-time supply chain integration within the cement industry. Studies by Helo and Shamsuzzoha (2020) and Lechler et al. (2019) have explored real-time supply chain processes, but their findings are limited to specific technologies, such as blockchain, or case studies that don't address the comprehensive needs of manufacturing firms. Lee (2021) focused on real-time systems in fashion, underscoring how timely supply chain integration can positively impact performance, but did not directly assess manufacturing. These studies highlight a lack of context-specific research that considers the unique operational challenges and potential benefits of integration within the cement sector. This gap underscores the need for a focused study on how supply chain integration practices influence the performance of cement manufacturing firms in Kenya, considering their specific challenges and the current lag in adopting advanced digital solutions. Such research would provide actionable insights to help firms in this sector optimize their supply chains and align with modern global standards.

1.2 Research Objective

i) To establish the influence of supplier integration on the performance of cement manufacturing firms in Kenya.
ii) To evaluate the moderating effect of collaborative capability on the relationship between supplier integration and performance of cement manufacturing firms in Kenya.

2. Literature Review

2.1 Supplier Integration

Supplier integration has been defined as the long-term relationship between the organization and its suppliers (Li *et al*., 2018). It is designed to leverage the strategic and operational capabilities of individual participating organizations to help them achieve significant ongoing benefits (Cui *et al*., 2022). According to Zhao et al. (2011), Supplier integration, also called 'backward' integration, refers to the process of interaction and collaboration between an organization and its suppliers to ensure an effective flow of supplies. Li et al. (2016) noted that supplier integration is the ability of an organization to develop, manage, and maintain a strong and long-term relationship with its suppliers, which is characterized by certain aspects and activities such as information sharing, coordination, trust, shared technologies, integrated processes, long-term contracts, assisting suppliers in improving production processes, fostering quality improvements, investing in suppliers' assets including suppliers in new product development, improving suppliers' overall capabilities, risk and reward sharing and shared gains from development efforts. Therefore, supplier integration results in improved decision-making, enhanced knowledge sharing, aligned capabilities, established learning routines, and improved performance of supply chain (SC) partners (Sahay, 2023; Echtelt *et al.,* 2018). Nonetheless, Yao et al. (2007) opined that supplier integration concerns data flow between two or more companies and constitutes a means of achieving process integration, under which a supplier takes control of the buyer's inventory and purchasing functions. Miguel and Brito (2021) argued that the main advantage of building long-term relationships with suppliers is the reduction of transaction costs through trust and reputation. Accordingly, supplier integration

involves the interchange of information, knowledge, and materials in different directions. Three key aspects of supplier relationships have been highlighted. First, the trend now is to build long-term relationships with suppliers rather than to rely on short-term contracts (Uwahomoro, 2018). Second, in conjunction with the first point, firms now use fewer suppliers over a longer period rather than maintaining a large base of suppliers, allowing them to change suppliers for almost every contract. The benefits of having a low price resulting from creating competition among suppliers have now changed into a low (price) total cost of ownership due to long-term and large volume of purchases (Helper, 2021). Third, the relationship with suppliers has been enhanced to a strategic level, where suppliers are now considered an integral part of the firm's operations (Sabir & Irfan, 2018).

Supplier partnerships do not take a specific shape; they can be tailored to the partnership's purpose. The selection and improvement of suppliers' functions, information sharing, and enhanced communication among institutions encourage a common trust and develop long-term relationships (Mzoughi *et al*., 2008). Integration between suppliers and organizations fosters shared responsibility, enabling suppliers to work effectively, reduce costs, and select superior components and technologies to support design (Li et al., 2006). In fact, supplier involvement in the design process allows manufacturers to select the best parts and facilitates the design and evaluation of products at minimum cost (Tan et al., 2002). Through coordination between organizations, wasted effort and time can be minimized or eliminated (Yang & Wei, 2013). As such, several researchers empirically demonstrated the essential role of supplier integration in differentiating firms, building competitive advantage, and improving overall SC performance (Dyer & Nobeoka, 2020; Kannan & Tan, 2018; Ketchen & Giunipero, 2014; Gupta, 2016)

2.2 Collaborative Capability

Oliveira (2016) states that supply chain performance is positively related to collaboration, driven by perceptions of improvements in product and service quality and reductions in lead time. However, even if the literature identifies mutual benefits for the partners, many practices are not carried out due to the difference of interest between the parties and lack of alignment; for that, a collaborative supply chain with integrated policies must be installed as an initiative to mitigate the possible harmful effects of the lack of integration between partners (Santos, Wujhno & Garcia, 2022). For collaboration in the supply chain, it is necessary to foster and strengthen a collaborative culture within organizations. Initially, an in-depth analysis of current practices, policies, and internal cultures is required, as is assessing the ability to implement the internal changes necessary to initiate successful collaborative relationships (Bowersox et al., 2018). To keep collaboration in the supply chain working, joint planning and strategic alignment must be monitored frequently, with the parties' objectives analyzed and updated (Bowersox et al., 2018). Soosay et al. (2018) defend joint planning as an effective way to improve planning between customers and suppliers, thereby reducing inventory levels and improving the match between supply and demand. Thus, joint planning is necessary to co-align operations and the capabilities of each collaborative partner (Min et al., 2018). According to Min et al. (2018), collaborative partners must solve problems together in the supply chain, constantly evaluating new process difficulties, proposing mutually developed ideas and improvements, resulting in cost reduction and more effective processes. In addition, according to the authors, it is recommended that cross-functional teams be formed to organize periodic meetings to resolve issues ranging from quality control to distribution operations.

Choi and Hwang's (2015) study investigated the role of collaborative capability in moderating the effects of GSCM practices on firm performance. Using hierarchical regression, the study analyzed survey data from 230 South Korean manufacturers. The results show that implementing GSCM practices can improve both the firm's environmental and financial performance. Also, the findings indicate that firms can expect improved financial performance when they seek to achieve synergies by involving their partners in the GSCM implementation process. Cao and Zhnag (2018) study sought to uncover the nature of supply chain collaboration and explore its impact on firm performance based on a paradigm of collaborative advantage. Reliable and valid instruments of these constructs were developed through rigorous empirical analysis. Data was collected through a Web survey of U.S. manufacturing firms in various industries. The statistical methods used include confirmatory factor analysis and structural equation modeling. The results indicate that supply chain collaboration improves collaborative advantage and indeed has a bottom-line influence on firm performance, and collaborative advantage is an intermediate variable that enables supply chain partners to achieve synergies and create superior performance. Santos, Wojahn, and Garcia (2022) studied the influence of supply chain collaboration on operational performance in the textile and metal-mechanical industries in Vale do Itajaí. They examined large industries of the Textile and Metal-mechanic segment of the Vale do Itajaí (SC). Using questionnaires administered in the supply area, covering a universe of 109 industries, data were collected from 66 companies. It was found that joint planning and collaborative culture are collaborative practices that influence operational performance. Regarding the performance factors, flexibility was absent across industries: after analyzing the moderating effect by segment, it was concluded that flexibility was present only in the Metal mechanics sector.

2.3 Performance of Cement Manufacturing Firms

Organizational performance refers to the extent to which an organization achieves a set of pre-defined targets aligned with its mission, vision, and goals. These targets can include both objective (numerical) and subjective (judgmental) indicators (Maduenyi et al., 2019). Studies have used market and financial criteria to operationalize organizational performance in terms of market share, return on investment, sales growth, profit margin on sales, market share growth, and return on investment growth. These studies have also contributed to investigating the relationships among operational performance, organizational performance, and SCM practices (Carroll, Johansen, & Mouritsen, 2021). There are three main categories of supply-chain-driven organizational performance (Wu, Chuang, & Hsu, 2019). The first category, resource performance, sees value as a way of achieving efficiency. The second category, output performance, views value addition as an organization's ability to provide high levels of customer service. The last category, flexibility performance, sees value addition as the ability of an organization to respond. These categories have seen increased attention by researchers in recent years.

Danise's (2023) study attempted to ascertain Supplier integration and company performance: A configurational view of whether these practices can exert a synergic effect. After examining data from a sample of 186 manufacturing plants, we can conclude that while taken supplier integration and fast supply network structure practices singly have a markedly positive effect on the performance goals considered (efficiency, schedule attainment, and flexibility), in addition, they interact to produce an additional synergic effect on efficiency and schedule attainment. The analyses also reveal that investing in FSNS or SI initiatives alone can be risky.

On the one hand, when companies fail to make any effort to structure their supply network to achieve fast lead times, the impact of supplier integration on efficiency and schedule attainment may be hindered, and in extreme cases, supplier integration might have no impact at all. On the other hand, investing only in fast supply network structure initiatives, without striving to achieve an adequate level of supplier integration, might well be useless: indeed, even detrimental to any improvement in firm performance.

Amoako-Gyampah et al. (2020) examined supplier integration, operational capability, and firm performance in an emerging economy environment. The literature on supplier integration's (SI) impact on firm performance is intertwined with mixed findings due to definitional differences, study context, specific integration components, and the types of relationships examined. Drawing on the relational view, the resource-based theory, and the Dynamics Capability theory, we suggest that improvements in firm performance from the supplier integration perspective are dependent on gains in operational capabilities. We test this dependency with survey data from firms in Ghana, a developing economy. The results show significant positive relationships between supplier integration and both competitive operational capabilities and firm performance. Molinaro et al. (2022) study focused on implementing supplier integration practices to improve performance: The contingency effects of supply base concentration. The study explores the impact of various types of supplier integration on the buyer's efficiency and innovation, as well as the contingency effects of supply base concentration, an important supply base design choice. Drawing upon Social Exchange Theory, argued that the expected benefits of supplier integration activities to efficiency and innovation are strengthened by supply base concentration. They tested the hypotheses using data collected from 324 manufacturing plants. Hierarchical regression results revealed that some supplier integration practices improve performance only at higher levels of supply base concentration, whereas the effects of other supplier integration types vary by the type of performance considered or are not significant at all.

2.4 Conceptual Framework

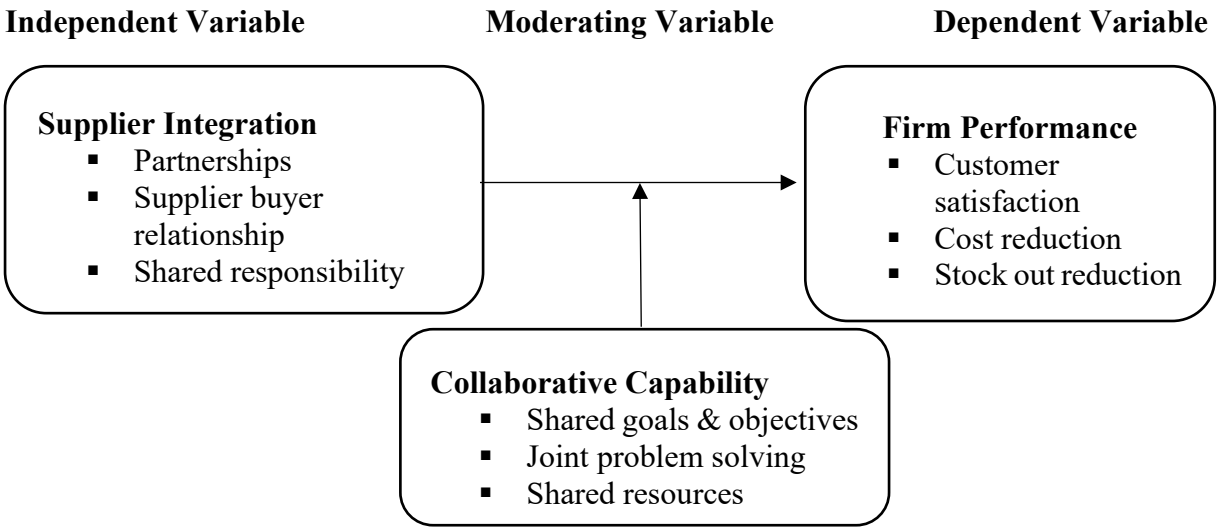

Figure 1: Conceptual Framework

3. Methodology

This study used a descriptive survey research design with a self-administered questionnaire, administered to 212 respondents selected from a target population of 450 managers in the supply chain-related sections of cement manufacturing firms in Kenya, registered by the Kenya Association of Manufacturers. The questionnaire was piloted by using 21 respondents from three Cement manufacturing firms. According to Kothari and Garg (2014), 10% to 30% of the population can be included in descriptive survey studies. Furthermore, a stratified sampling technique, with a proportionate allocation of the sample sizes (from different firms) was used, followed by simple random sampling from each stratum, which comprised the employees working for the various cement manufacturing firms in the supply chain-related departments. Supplier integration was measured by sub-constructs of partnerships, supplier-buyer relationships, and shared responsibility with extensively validated 6-question items. To operationalize collaborative capability, the sub-constructs of shared goals and objectives, joint problem-solving, and shared resources were also used, with 6 questionnaire items. Similarly, firm performance was measured using customer satisfaction, cost reduction, and stock-out reduction, with 6 questionnaire items in total. All the items were measured on a five-point Likert scale that ranged from 1=Strongly Disagree to 5= Strongly Agree. The Cronbach alpha coefficients for the data obtained were 0.871, 0.878, and 0.894 for supplier integration, collaboration capability, and firm performance, respectively. Descriptive statistics of percentages, means, and standard deviations were used to analyze the data before the bivariate correlation and linear regression analyses were conducted to test whether supplier integration has a significant effect on firm performance. Furthermore, hierarchical and stepwise regression analyses were conducted to assess whether collaborative capability moderates the relationship between supplier integration and performance in cement manufacturing firms. The estimated regression models used to investigate these relationships are shown below.

$$Y = \alpha + X\beta_1 + \mu \quad \text{..... (I)}$$

$$Y = \alpha + X\beta_1 + ZX\beta_2 + \mu \quad \text{..... (II)}$$

4. Results and Discussion

This study was analyzed using both descriptive statistics, such as percentages, means, and standard deviations, and inferential statistics, including correlations, linear, hierarchical, and stepwise regressions.

4.1 Descriptive Analysis

4.1.1 Supplier Integration Descriptive Statistics

This research study obtained the means, standard deviations, and percentage responses for each item. A five-point Likert scale was used to gain these responses; the measurement ranges from 1= strongly disagree, 2= Disagree, 3= Neutral, 4= Agree, and 5= strongly agree. Accordingly, the findings in Table 1 show that the majority (49.3 percent) of respondents agreed with the suggestion that their organization views their supplier as a strategic partner in achieving mutual business goals. Another 27.3 percent strongly agreed with this view, while nearly 8 percent of respondents could not agree or disagree with the same statement. On the other hand, only 15.3 percent of respondents disagreed with this view. The response rate to this item was 3.977, with a standard deviation of 0.935.

In addition, results from Table 1 also indicate that a majority (56.7 percent) of the respondents agreed with the statement, suggesting that they have long-term partnerships with key suppliers in order to foster stability and continuous improvement. Another 26.0 percent strongly agreed with the same statement.

However, only 6.0 percent of the respondents disagreed with the statement, with another 4.7 percent strongly disagreeing. 6.7 percent remained indifferent to the said statement, since they could not agree or disagree with the said statement. The statement gave a mean of 3.946 and a standard deviation of 0.485.

Similarly, the result in Table 1 indicated that a majority (48.0 percent) of respondents agreed with the statement, suggesting that the communication between their organizations and the suppliers is open and frequent. 25.4 percent of the respondents strongly agreed with this view.

On the contrary, only 17.9 percent of respondents disagreed with this statement, with a paltry 8.7 percent unable to agree or disagree. It obtained a mean of 3.939 and a standard deviation of 0.916.

Furthermore, results in table 1 also revealed that a majority (54.0 per cent) of respondents agreed that the organization that they work for does maintain a high level of trust and transparency with the suppliers as they strengthen their business relationships, with another 26.0 per cent strongly agreeing Another 7.3 per cent of the respondents disagreed with the said statement while 4.7 per cent of the respondents strongly disagreeing with the same statement. Only 8.0 percent of those participating remained indifferent. Nonetheless, this response gave a mean of 3.869 and a standard deviation of 0.863.

Consequently, the results in Table 1 also show that a majority (36.7 percent) of respondents agreed that they work collaboratively with their suppliers to address and resolve supply chain disruptions or challenges, while 38.0 percent strongly agreed with the statement. Another 16.0 percent disagreed with the same statement, with only 2.7 percent strongly disagreeing, while a paltry 6.7 percent of respondents were unable to agree or disagree. A mean of 3.823 and a standard deviation of 0.796 were obtained.

In a similar fashion, a majority (44.0 percent) of respondents also agreed that their suppliers are actively involved in their product development process, contributing valuable insights and innovation. Another 40.7 of the participants in this research study strongly agreed with the same statement. However, 8.0 percent disagreed with the same statement, with another 4.7 percent strongly disagreeing, while only 2.7 percent were indifferent. This response gave a mean of 3.811 with a standard deviation of 0.815.

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Table 1: Supplier Integration Descriptive Results

		1 %	2 %	3 %	4 %	5 %	Mean	Std dev.
1	Our organization views its suppliers as strategic partners in achieving mutual business goals	6.0	9.3	8.0	49.3	27	3.977	0.935
2	We have long-term partnerships with our key suppliers to foster stability and continuous improvement	4.7	6.0	6.7	56.7	26	3.946	0.485
3	The communication between our organization and our suppliers is open, frequent, and effective	6.0	11.9	8.7	48	25	3.939	0.916
4	We maintain a high level of trust and transparency with our suppliers, which strengthens our business relationships	4.7	7.3	8.0	54	26	3.869	0.863
5	We work collaboratively with our suppliers to address and resolve any supply chain disruptions or challenges	2.7	16	6.7	36.7	38	3.823	0.796
6	Our suppliers are actively involved in our product development process, contributing valuable insights and innovations	4.7	8.0	2.7	44	40	3.811	0.815
	Aggregate						**3.857**	**0.823**

4.1.2 Collaborative Capability Descriptive Results

This study also sought to determine the moderating effect of collaborative capability on the relationship between supplier integration and firm performance. Collaborative capability was operationalized by nine (6) questionnaire items, which were validated. The research study obtained the means, standard deviations, and percentage responses for each item. A five-point Likert scale was used to gain these responses; the measurement ranges from 1= strongly disagree, 2= Disagree, 3= Neutral, 4= Agree, and 5= strongly agree. Results are presented in Table 2.

The findings in Table 2 show that an accumulative majority of 33.4 percent of respondents agreed with the statement, suggesting that their organizations collaborate with supply chain partners to jointly identify and solve problems and enhance overall efficiency. On the contrary, 53.3 percent of respondents disagreed with this statement, while only 2.0 percent strongly disagreed. However, another 11.3 percent could neither agree nor disagree with the same statement. The statement's response yielded a mean of 3.936 and a standard deviation of 0.708.

Similarly, the results in Table 2 show that a majority (75.2 percent) of respondents believe their organizations have established processes for collaborative problem-solving with their supply chain partners. Another 3.7 percent of respondents strongly agreed with this statement. On the contrary, 10.0 percent of those surveyed could not agree with the same statement, while another

1.2 percent strongly disagreed with it. Nonetheless, 8.8 percent of those who participated in this study could not agree or disagree with the same statement. Furthermore, the statement's response gave a mean of 3.738 and a standard deviation of 0.683.

In addition, the results in Table 2 revealed that the cumulative majority (A=53.3 percent, SA=16.0 percent) of respondents agreed that they work closely with their supply chain partners to establish shared goals and objectives that ultimately benefit the involved parties. 4.0 percent of those surveyed could not agree with the said statement, while 1.3 percent strongly disagreed with the same statement. Substantially, 25.3 percent could neither agree nor disagree with the statement. A mean of 3.898, and a standard deviation of 0.925 were obtained for this statement.

Furthermore, 23.3 percent (a majority) of respondents agreed that their supply chain partners are committed to achieving common goals that enhance their collective efforts, while another 22.0 percent strongly agreed. On the contrary, 20.0 percent of the participants disagreed with the statement, while another 1.8 percent strongly disagreed. 16.7 percent could neither agree nor disagree with the same statement, having 3.862 as the response's mean, while 0.821 was the standard deviation.

Consistently, Table 2 shows that 69.6 percent (the majority) of respondents agreed that there is a fair and transparent allocation of financial resources for shared projects with their supply chain partners. Another 2.8 percent strongly agreed with the same statement. However, 6.5 percent of the respondents could not agree, while 4.5 percent strongly disagreed with the statement. Substantially, 16.6 percent of respondents could neither agree nor disagree with the same statement. This statement gave a mean of 3.678, with a standard deviation of 0.660.

Similarly, another majority (18.0 percent) of respondents agreed that they engage in joint financial planning and investments with their supply chain partners to support shared initiatives. Another 16.0 percent of the respondents strongly agreed with the same statement. Nonetheless, 22.7 percent could not agree with the statement, while another 23.3 percent strongly disagreed with it. 20.0 percent could not agree nor disagree with the statement. Thus, the statement's response yielded a mean of 3.838 and a standard deviation of 0.809. These findings are presented and shown in Table 2.

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Table 2: Collaboration Capability Descriptive Results

		1 %	2 %	3 %	4 %	5 %	Mean	Std. dev.
1	Our organization collaborates with supply chain partners to jointly identify and solve problems, enhancing overall efficiency	2.0	53.3	11.3	16.7	16.7	3.936	0.708
2	We have established processes and forums for collaborative problem-solving with our supply chain partners	16	53.3	25.3	4.0	1.3	3.898	0.925
3	We work closely with our supply chain partners to establish shared goals and objectives that benefit all parties involved	18	20.0	16.7	23.3	22.0	3.862	0.821
4	Our supply chain partners are committed to achieving common goals, which enhances our collaborative efforts.	23	22.7	20.0	18.0	16.0	3.838	0.809
5	There is a fair and transparent allocation of financial resources for shared projects with our supply chain partners	17	26	16.7	19.3	20.7	3.810	0.981
6	We engage in joint financial planning and investment with our supply chain partners to support shared initiatives.	4.7	24	13.3	38.7	19.3	3.808	0.879
7	**Aggregate**						**3.827**	**0.838**

4.1.3 Performance of Cement Manufacturing Firms in Kenya

This research study examined how well cement manufacturing firms in Kenya perform in terms of customer satisfaction, cost reduction, and stockout reduction. Therefore, firm performance was operationalized using six (6) questionnaire items and subdivided into the customer satisfaction, cost reduction, and stock-out reduction subconstructs, as adapted from previous research. All measures of firm performance used a 5-point Likert scale, ranging from 5 = strongly agree (SA) to 1 = strongly disagree (SD), and the results are shown in Table 3.

According to Table 3, a majority (49.3 percent) of respondents reported that manufacturing processes in their firms consistently meet or exceed customer expectations for product quality. Another 27.3 percent of the respondents strongly agreed with the same statement. On the other hand, 9.3 percent of respondents disagreed with the same statement, while 6.0 percent strongly disagreed. 8.0 percent of the respondents could not agree or disagree with the said statement. A mean and standard deviation of 3.996 and 1.008 were obtained, respectively.

Similarly, the results in Table 3 revealed that a majority (56.7 percent) of respondents agreed that their organizations regularly gather customers' feedback and use it to improve

manufacturing processes and product offerings. Accordingly, 26.0 percent of the respondents strongly agreed with the said statement. On the contrary, 6.0 percent of the participants disagreed with the statement, while another 4.7 percent strongly disagreed with it. However, 6.0 percent of those surveyed could neither agree nor disagree with the same statement. The statement's response gave a mean of 3.950 and a standard deviation of 1.030

Furthermore, the findings in Table 3 revealed that a majority (48.0 percent) of respondents indicated that their organizations have a high rate of repeat customers, indicating strong customer satisfaction with their products and services. Consistently, another 25.4 percent strongly agreed with the said statement. Nonetheless, 11.9 percent of the respondents could not agree with the statement, while 6.0 percent disagreed strongly. 8.7 percent could not agree or disagree with the said statement, which also gave a mean of 3.885 and a standard deviation of 0.909.

In addition, the results in Table 3 show that a majority (54.0 percent) of respondents agreed that their firms have implemented effective, cost-effective strategies in manufacturing processes. Another 26.0 percent strongly agreed with the same statement. However, 7.3 percent of the respondents could not agree with the statement, while another 4.7 percent strongly disagreed with it. Only 8.0 percent could neither agree nor disagree with it. A mean and standard deviation of 3.868 and 1.258 were obtained, respectively.

Consequently, the findings in Table 3 indicated that a majority (38.0 percent) of respondents agreed strongly that their organizations continually seek ways to reduce manufacturing costs without compromising product quality. Consistently, another 36.7 percent of respondents agreed with the statement as declared. On the other hand, the results also indicated that 16.0 percent of respondents disagreed, 2.7 percent strongly disagreed, and 6.7 percent neither agreed nor disagreed. Means of 3.871 and a standard deviation of 1.177 were obtained, respectively.

Equally, the findings in Table 3 show that a majority (44.0 percent) of respondents agreed that their organizations' cost-saving initiatives have led to a significant reduction in the overall production costs. 40.7 percent of the respondents in this study strongly agreed with this view; however, only 8.0 percent of the respondents could not agree with the said statement, with another 4.7 percent strongly disagreeing with it, while 2.7 percent did not agree nor disagree. A mean and standard deviation of 3.869 and 0.765 were obtained, respectively. These findings are presented and shown in Table 3.

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Table 3: Performance of Cement Manufacturing Firms in Kenya

		1 %	2 %	3 %	4 %	5 %	Mean	Std. dev.
1	The manufacturing processes at our firm consistently meet or exceed customer expectations for product quality.	6.0	9.3	8.0	49.3	27.3	3.996	1.008
2	My organization gathers customer feedback regularly and uses it to improve the manufacturing processes and product offerings	4.7	6.0	6.7	56.7	26.0	3.950	1.030
3	My organization has a high rate of repeat customers, indicating strong satisfaction with our products and services	6.0	11.9	8.7	48.0	25.4	3.885	0.909
4	My firm has implemented effective cost-reduction strategies in the manufacturing processes	4.7	7.3	8.0	54.0	26.0	3.868	1.258
5	My organization continuously seeks ways to reduce manufacturing costs without compromising on product quality	2.7	16.0	6.7	36.7	38.0	3.871	1.177
6	My organization's cost-saving initiatives have led to a significant reduction in overall production costs	4.7	8.0	2.7	44.0	40.7	3.869	0.765
	Aggregate						**3.847**	**0.868**

4.2 Inferential Analysis

To further test for the effect of supplier integration on the performance of cement manufacturing firms, a correlation (bivariate) and linear regression analysis was carried out. The result of the correlation analysis is presented in Table 4 and interpreted.

4.2.1 Correlation Analysis

Table 4: Correlation Matrix

		1	2	3
1	Supplier integration	1		
2	Collaboration capability	.572**	1	
3	Firm Performance	.399**	.578**	1

**Correlation is significant at the 0.01 level (2-tailed).

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The findings in Table 4 (correlation matrix) revealed that supplier integration has a positive and significant effect on the performance of cement manufacturing firms in Kenya (r=0.399**, p<0.01). This finding was corroborated by previous studies (Danise, 2023; Molinaro et al., 2022; Amoako-Gyampah *et al.,* 2020). Therefore, this study can infer that supplier integration has a positive and significant effect on the performance of cement manufacturing firms in Kenya.

4.2.2 Supplier Integration and Performance of Cement Manufacturing Firms

To determine the amount of variation in the independent variable (supplier integration) that would explain a given change in the predicted variable (firm performance), a linear regression analysis was conducted, and the results are presented in Table 5. In view of these results, supplier integration has a positive and significant effect on firm performance (r = 0.528**, p < 0.01). However, to determine the specific amount of influence, competence development (predictor variable) was regressed against employee commitment, and the results are presented in tables 5 and 6 and interpreted thereof.

Table 5: Model Summary

					Change Statistics		
Model	R	R Square	Adjusted R-Square	Std. Error of the Estimate	R Square Change	F Change	Sig. F Change
1	.399[a]	.159	.155	.55546	.159	38.110	.000

a. Predictors: (Constant), Supplier Integration

The study findings, as shown in Table 5, indicate the amount of variance in firm performance (the predicted variable) explained by a given change in supplier integration (the second predictor variable). The results of the regression analysis, as shown in Table 5, yielded a correlation coefficient (R) of 0.399 and R^2 = 0.159. This implies that 15.9 percent of the corresponding change in firm performance could be explained by the supplier integration. Furthermore, the results in Table 5 yielded an F change value of 38.110, p < 0.01, which is sufficiently large to support the goodness of fit of the estimated regression model explaining variation in firm performance. Therefore, this confirms that supplier integration is a useful predictor for the firm's performance in Kenya. Table 6 shows the unstandardized coefficients of supplier integration.

Table 6: Supplier Integration Coefficients

		Unstandardized Coefficients		Standardized Coefficients		
	Model	B	Std. Error	Beta	T	Sig.
1	(Constant)	2.549	.190		15.096	.000
	Supplier Integration	.519	.062	.399	9.331	.000

a. Dependent Variable: Firm Performance

Further, the unstandardized coefficient β for the computed scores of supplier integration was 0.399, with a t-value of 9.331, $p < 0.05$. Since the t-value exceeds 1.96, the estimated regression model in Table 5 is significant and applicable. Similarly, with $p < 0.05$, this implies that for every 5 percentage-point increase in supplier integration, there was a predicted increase in the percentage of firms with zero performance. Therefore, having achieved the set objective, this study rejected the null hypothesis, stating that H_{01}: supplier integration has no significant influence on firm performance.

4.2.3 Moderation Relationship

This study also sought to determine the moderating effect of collaborative capability on the relationship between supplier integration and the performance of cement manufacturing firms in Kenya. To test for the moderating effect, the study conducted a hierarchical regression analysis. In so doing, the explained variable (firm performance) was kept in raw form, while the predictor variables (supplier integration) and the moderating variable (collaborative capability) were mean-centered. According to Chauhan *et al.* (2017), mean centering of variables tends to reduce the risk of multicollinearity. After mean centering, the predictor variable (supplier integration) was multiplied by the moderating variable (collaborative capability) to create the interaction term. Furthermore, a series of linear regression analyses was conducted using the standardized predictor and moderating values as predictors and the explained variable as the criterion (hierarchical regression). This analysis sought to first determine the effect of the selected control variables (age, highest level of education, job category, and work experience) on the predicted variable (firm performance). This was followed by a series of linear regression analyses. Lastly, stepwise regression analysis was carried out to determine the incremental contribution of the variables used in explaining the change in the dependent variable.

In step 1, three demographic variables of age, level of education, and experience were used as control variables, and generated model 1. Controlling for these variables was necessary because some of them have been found to affect certain outcomes (Eshiteti, 2019; Magosh & Chang, 2009). According to Magosh and Chang (2009), higher levels of education tend to influence an individual's performance. In step 2, the predictor variable for supplier integration was added to the regression model, yielding model 2. Nonetheless, the variables were entered into the regression model after standardizing them to reduce the risk of multicollinearity in the analysis. It ensured that the Variance Inflation Factor (VIF) scores were all below 10.0. In step 3, the standardized moderating variable (collaborative capability) was added to the regression model, yielding model 3, shown in Table 6. Finally, step four involved adding the interaction term (products of the standardized predictor variables and the moderating variable) to obtain model 4. Therefore, the hierarchical regression model summary that was obtained is shown in Table 7:

Table 7: Model Summary

Model	R	R Square	Adjusted R-Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	Sig. F Change
1	.119[a]	.014	.005	.70717	.014	4.554	.276
2	.416[b]	.173	.171	.49927	.159	64.976	.000
3	.623[c]	.388	.382	.48956	.215	76.368	.000
4	.715[d]	.511	.509	.42127	.123	23.676	.000

a. Predictors: (Constant), work experience, age, education level
b. Predictors: (Constant), work experience, age, education level, supplier integration
c. Predictors: (Constant), work experience, age, education level, supplier integration, collaborative capability
d. Predictors: (Constant), work experience, age, education level, supplier integration, collaborative capability, supplier integration X collaborative capability

The results in Table 8, showing Model 1, indicate that, cumulatively, all three demographic variables (control variables for this study) have a positive, albeit insignificant, association with firm performance ($r = 0.119$, $p > 0.05$). This did show that the control variables were weakly but positively correlated to firm performance ($r = .119$). Therefore, this model was insignificant ($p>0.05$) and explained only 1.4% of the variance in firm performance (the dependent variable). Hence, this model was neither a good fit nor applicable. Furthermore, the addition of the standardized independent variable (supplier integration) to model 1 generated model 2, as shown in Table 8. Subsequently, supplier integration was found to be positive and significantly correlated to the performance of cement manufacturing firms in Kenya ($r=0.416$, $p<0.01$). The R^2 value increased from .014 to .173, implying that the second model could explain 17.3 percent of the variance in firm performance at $p < .01$. These findings supported the alternative hypothesis that supplier integration has a positive and significant effect on firm performance. Therefore, model two was statistically significant and applicable.

Similarly, the findings in Table 8 also revealed that when collaborative capability (moderating variable) was added, it yielded Model 3, which indicated that together with the predictor variable (supplier integration) and collaborative capability (moderating variable) were significantly and jointly correlated with firm performance ($r =0.388$, $p<0.01$). Accordingly, when all demographic variables were controlled, the relationship between supplier integration (in addition to collaborative capability) and firm performance was positive and statistically significant. That is to say, the change in R2 is 0.159, from 0.173 to 0.388. Therefore, Model 3 could explain 38.8 percent of the 17.3 percent of the variance in firm performance. Finally, to determine how collaborative capability moderates the relationship between supplier integration and firm performance, the interaction term (supplier integration x Collaborative capability) was entered into the regression model, yielding model 4. This increased the R-squared from .388 to .511. The findings revealed that collaborative capability has a positive and significant moderating effect on the relationship between supplier integration and the performance of

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cement manufacturing firms in Kenya (R = 0.715, R^2 = 0.511, p<0.01). This meant that, under moderation, supplier integration could account for 51.1 percent of the variance in firm performance. This model was significant and applicable (p < .01). Therefore, the hierarchical regression results revealed that, with the addition of the interaction terms, the effect of supplier integration on firm performance was enhanced by collaborative capability as the moderator. Furthermore, this influence was found to be strong and positive (r = .776, p < .01). Therefore, this study concluded that collaborative capability moderates the relationship between supplier integration and firm performance. Nonetheless, hierarchical regression analysis can help determine whether a variable of interest statistically explains a significant amount of variance in the dependent variable after accounting for all other variables (Eshiteti, 2019; Cohen, Cohen, West, & Aiken, 2003). This can be observed in Table 8, the unstandardized coefficient.

Table 8: Unstandardized Coefficients (Hierarchical Regression)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
Step 1: Control Variables						
1	(Constant)	4.562	.465		9.807	.000
	Age	.036	.082	.035	.443	.658
	Education Level	-.115	.091	-.090	-1.269	.206
	Length of Service	.005	.049	.008	.093	.926
R=0.119, R^2 = 0.019, ΔR^2 =0.014, FΔ (3, 211) =4.554, P = 0.276						
Step 2: Independent Variable						
2	(Constant)	3.849	.412		9.347	.000
	Supplier integration	.389	.043	.521	9.047	.000
R=0.416, R^2 = 0.173, ΔR^2 =0.159, FΔ (1, 210) =64.976, P = 0.000						
Step 3: Moderating Variable						
3	(Constant)	3.863	.352		10.975	.000
	Collaborative capability	.391	.041	.525	9.613	.000
R=0. 623, R^2 = 0.388, ΔR^2 =0.215, FΔ (1, 209) =26.368, P = 0.000						
Step 4: Interaction Term						
4	(Constant)	4.136	.344		12.008	.000
	Supplier integration *collaborative capability	-.133	.030	-.209	-4.499	.000
R=0.715, R^2 = 0. 511, ΔR^2 =0.123, FΔ (1, 208) =23.676, P = 0.000						

a. Dependent Variable: Firm Performance

The findings in Table 8 reported the unstandardized coefficients from a hierarchical regression analysis. Model 1 in Table 7 indicated that none of the control variables (age, education level, and length of service) were significant predictors of firm performance. However, the effect of the control variables on firm performance changed when the predictor variable (supplier integration) was added to obtain model 2. The non-significant results for all control variables and employee commitment were altered when competence development (a predictor) was added and controlled for, highlighting the importance of supplier integration for firm

performance. The addition of mean-centered collaborative capability scores in Model 3 led to a significant increase in R^2. It showed that the model could explain 38.8 percent of the change in firm performance when collaborative capability was added as a moderator, from 17.3 percent, with $p < 0.01$. Similarly, model 4 in Table 7 showed that, when controlled, the coefficient values for the computed (composite index) standardized scores of supplier integration were significant when the interaction term between supplier integration and collaborative capability was added. The R^2 value increased from 38.8 percent to 51.1 percent, indicating a change in cement manufacturing firms' performance.

5. Conclusion

The first null hypothesis for this variable was 'supplier integration has no effect on the performance of cement manufacturing firms in Kenya'. However, the study found that supplier integration is statistically significant in explaining the performance of cement manufacturing firms in Kenya. The effect was positive, indicating that greater supplier integration would improve the performance of cement manufacturing firms in Kenya. Therefore, the study rejected the null hypothesis and concluded that supplier integration is positively and significantly related to the performance of cement manufacturing firms in Kenya.

The second null hypothesis tested was that 'collaborative capability has no significant moderating effect on the relationship between supplier integration and performance of cement manufacturing firms in Kenya'. The study revealed that collaborative capability is statistically significant in explaining the performance of cement manufacturing firms in Kenya, and hence the null hypotheses were rejected.

6. Recommendations

The findings of this research study show that supplier integration practice was positively and significantly correlated with the performance of cement manufacturing firms in Kenya. This means that the influence of supplier integration on the performance of the cement manufacturing sector was positive and statistically significant. Therefore, the recommendations of this study are to make deliberate efforts to integrate suppliers into the supply chain through key practices such as supplier-buyer relationships, forecasting, and planning, as well as sharing responsibilities and sales data.

Future research could examine the effects of other supply chain integration practices on manufacturing firms' performance in Kenya. For instance, third-party logistics integration, information technology integration, and many others. This would provide a more comprehensive understanding of the complex dynamics that affect firm performance in Kenya.

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