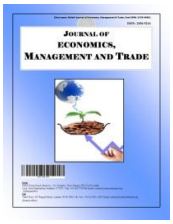

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Enhancing Operational Performance through Supply Chain Management Practices: Evidence from Firms in the Petroleum Downstream

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Authors' contributions

This work was carried out in collaboration among all authors. Author SKN designed the study, wrote the protocol and wrote the first draft of the manuscript. Author JA was instrumental in the literature searches, data collection and assisted in the data analysis. Author PB managed the analyses of the study and was instrumental in proofreading the manuscript. All authors read and approved the final manuscript.

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ABSTRACT

Aims: Whilst adoption of supply chain management (SCM) practices has grown in recent decades, research into supply chain management practices of firms in the petroleum downstream remains very limited. This study examines the effect of SCM practices on operational performance for firms in the petroleum downstream.
Study Design: Survey.
Place and Duration of Study: The study was conducted in Ghana from January 2019 to February 2020.
Methodology: The study developed and tested a research model which proposed that Strategic Supplier Partnership, Customer Relationship, Supply Chain Information Management and Postponement significantly influenced Operational Performance of firms in the petroleum downstream. Data for the study was obtained from a survey of 150 firms operating in Ghana's petroleum downstream.

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Results: The findings of the study revealed that Strategic Supplier Partnership and Supply Chain Information Management had positive and significant impacts on Operational Performance, but Customer Relationship and Postponement did not.
Conclusion: Firms operating in the petroleum downstream should focus more on developing and managing strategic partnerships with their suppliers and managing their supply chain information.

Keywords: Supply chain management; supply chain management practices; petroleum downstream; partial least squares structural equation modeling; PLS-SEM.

1. INTRODUCTION

Supply Chain Management (SCM) deals with the design of seamless value-added processes across organizational boundaries to meet the real needs of the end customer [1]. SCM help firms fulfil the fundamental role of providing customer with the right product, of right quality and quantity, from a right source at right price, utilizing the right technology [1]. Externally, organizations are advised to seek closer collaboration and coordination with suppliers and customers, whilst internally, the focus is on the management of the information flow, material flow, and monetary organizational flow [2]. SCM practices involve a set of activities undertaken by an organization to promote effective management of its supply chain [3]. SCM and other important strategies are critically important to the success of the petroleum sector. Many organizations in the petroleum downstream and beyond are embracing the concept of SCM because they have realized that to function effectively and gain the competitive advantage they must work in collaboration with channel members. It has been noted that the widespread use of the internet and many web-based systems has further enabled many organizations to form a strong relationships with supply chain members to enable them better manage their supply chain operations [4,5].

Academic interest in SCM has grown over the past three decades. Several studies have sought to outline the various SCM practices and how they may impact on organizational performance [2,6,7]. However, little insight exists on how SCM practices impact the performance of firms in the petroleum downstream. The petroleum downstream remains an area that is witnessing phenomenal growth in the adoption of SCM practices [8], yet research into how these SCM practices impact operational performance in the petroleum downstream is sparse. Additionally, despite decades of SCM initiatives in the petroleum downstream, the supply chain is still fraught with issues of stock-outs, fuel shortages, high operational costs, and other logistics challenges [8]. It is clear that examining whether and how SCM practices enhance the operational performance of firms in the petroleum downstream is imperative. This study sets out to address this research gap by examining the effect of SCM practices on the operational performance of firms in the petroleum downstream.

The study is significant in a number of ways. First, the study presents new insights into the effect of SCM practices on operational performance of firms in the petroleum downstream, a previously unexplored subject. The study thus helps fill the identified research gap by exploring how SCM practices directly enhance the operational performance of firms in the petroleum downstream. This could help guide managers of firms in the petroleum downstream in their SCM initiatives and help them extract the maximum possible benefits from their SCM practices. The rest of the paper is organized as follows. A review of literature is presented next, followed by a discussion of the theory and research model. Next, the methodology is presented, which is followed by the results of the study. The study concludes with a discussion of the results, recommendations and implications of the study.

2. RELEVANT LITERATURE

2.1 SCM Practices

Over the last three decades, academic interest in and practice of SCM has grown considerably. There has however not been consensus on what actually constitutes SCM practice, with different authors conceptualizing SCM practices in different ways. For example, [9] conceptualized SCM practices to include Information sharing, Long term relationships, Advanced planning, systems, Leveraging the internet, Supply network structure, and Distribution network structure. [10] considered the following as the dimensions of SCM practices: Strategic Supplier Partnership,

Customer Relationship, Information Sharing, Information Quality, Lean Systems, Commitment and Trust. The study of [11] considered Strategic Partnership with Suppliers, Level of Information Sharing, Quality of Information Sharing, Internal Supply Chain Process, and Lean Practices. Amedofu et al. [2] examined Supplier Relationship, Customer Relationship, Level of Information Sharing and Quality of Information Sharing as the dimensions of SCM practices. This study will focus on SCM practices that are particularly relevant to firms operating in the petroleum downstream of an emerging economy, and identifies Strategic Supplier Relationship, Customer Relationship, Information Management, and Postponement as SCM practices to be explored.

2.2 Previous Studies on the Effect on SCM Practices on Performance

Some previous studies have been conducted to empirically examine the effect of SCM practices on performance of firms. For example, [6] explored the effect of information systems and SCM practices (strategic collaboration and lean practices, supplier selection practices, and procurement practices) on operational performance of manufacturing SMEs in Turkey. Their study confirmed that both SCM practices and information systems practices had positive effects on operational performance of firms. The study of [3] also examined the influence of SCM practices (strategic collaboration and lean practices and outsourcing and multi-suppliers) on operational performance and SCM-related organizational performance of SMEs. Their findings revealed that SMEs with higher levels of SCM practices had higher levels of operational performance. Li et al. [7] explored the effect of SCM practices (strategic supplier partnership, customer relationship, level of information sharing, quality of information sharing, and postponement) on competitive advantage and organizational performance. Their findings revealed that SCM practices had a significant effect on organizational performance and competitive advantage. More recently, the study of [2] explored the effect of SCM practices (customer relationship, supplier relationship, supply chain information sharing, and supply chain information management) of start-ups on their customer development and start-up performance. Their findings revealed that SCM practices significantly enhanced the customer development capabilities and start-up performance of entrepreneurial start-ups. [11] have also explored the effect of SCM practices (Strategic Partnership with Suppliers, Level of Information Sharing, Quality of Information Sharing, Internal Supply Chain Process, and Lean Practices) on Innovation and Organizational Performance. Their findings indicated that Quality of Information Sharing and Lean Practices had statistically significant effects on Organizational Performance.

The researchers' review of literature revealed no previous studies have examined the effect of SCM practices on the performance of firms in the petroleum downstream. This means there is absence of context-specific insights on how SCM practices enhance performance in the petroleum downstream. This study addresses this research gap in the SCM literature.

2.3 Theoretical Background

The study is underpinned by the resource based view. Resource base view stresses on the role of internal and external resources and capabilities in achieving superior performance [12]. According to the resource based view, firms can achieve sustainable competitive advantage when they control resources and capabilities which are rare, valuable, heterogeneous and inimitable [12,13]. Resources may include assets, information and knowledge whilst capabilities consist of knowledge based organizational processes and routines [14]. This study proposes that firms that firms that practice effective SCM obtain valuable resources and capabilities that enable them achieve superior operational performance.

2.4 Research Model

Four SCM practices are explored in this study namely Strategic Supplier Partnership, Customer Relationship, Supply Chain Information Management, and Postponement. The SCM practices are explored as first order constructs. *Strategic Supplier Relationship* in this study refers to a strategic collaborative relationship developed between a firm and its suppliers which leverages on each other's capabilities and competences in order to reap mutually beneficial rewards [7,15]. Creating and managing strategic relationships with suppliers allows both parties to collaborate and work towards reducing stock-outs, minimizing waste, reducing costs, and meeting delivery schedules [2]. *Customer Relationship* refers to the practice of managing customer complaints and building long term

relationships with customers [2,7]. Customers are the lifeblood of businesses, and firms that create effective relationships with the customers are expected to do well [16,17]. *Supply Chain Information Management* examines the volume and quality of supply chain information shared between organizations and its supply chain partners [2,15]. Sharing important supply chain information with channel members enhances the effectiveness of the supply chain and creates greater value for firms in the supply chain [18]. The information shared should be error-free, timely and adequate for real benefits to be obtained [2,19]. Finally, *Postponement* is defined as the practice of moving forward one or more operations or activities (making, sourcing and delivering) to a much later point in the supply chain [15]. Postponement allows an organization to be flexible in developing different versions of the product in order to meet changing customer needs, and to differentiate a product or to modify a demand function [20]. This is expected to increase the organization's flexibility and minimize supply chain costs [21,22].

A central objective of effective SCM is to create a major source of competitive advantage for the enterprise to differentiate itself in the eyes of the customers from its competitors by operating at a lower cost, higher quality, or greater delivery dependability [23]. According to [24], *Operational Performance* is a firm's performance which is measured against standard on prescribed effectiveness, efficiency and environment responsibility such as cycle time, productivity, waste reduction and regulatory compliance. Operational Performance is explored as a second-order construct, with Quality Improvement, Cost Reduction, and Delivery Dependability as first-order constructs. The research model of the study is shown in Fig. 1.

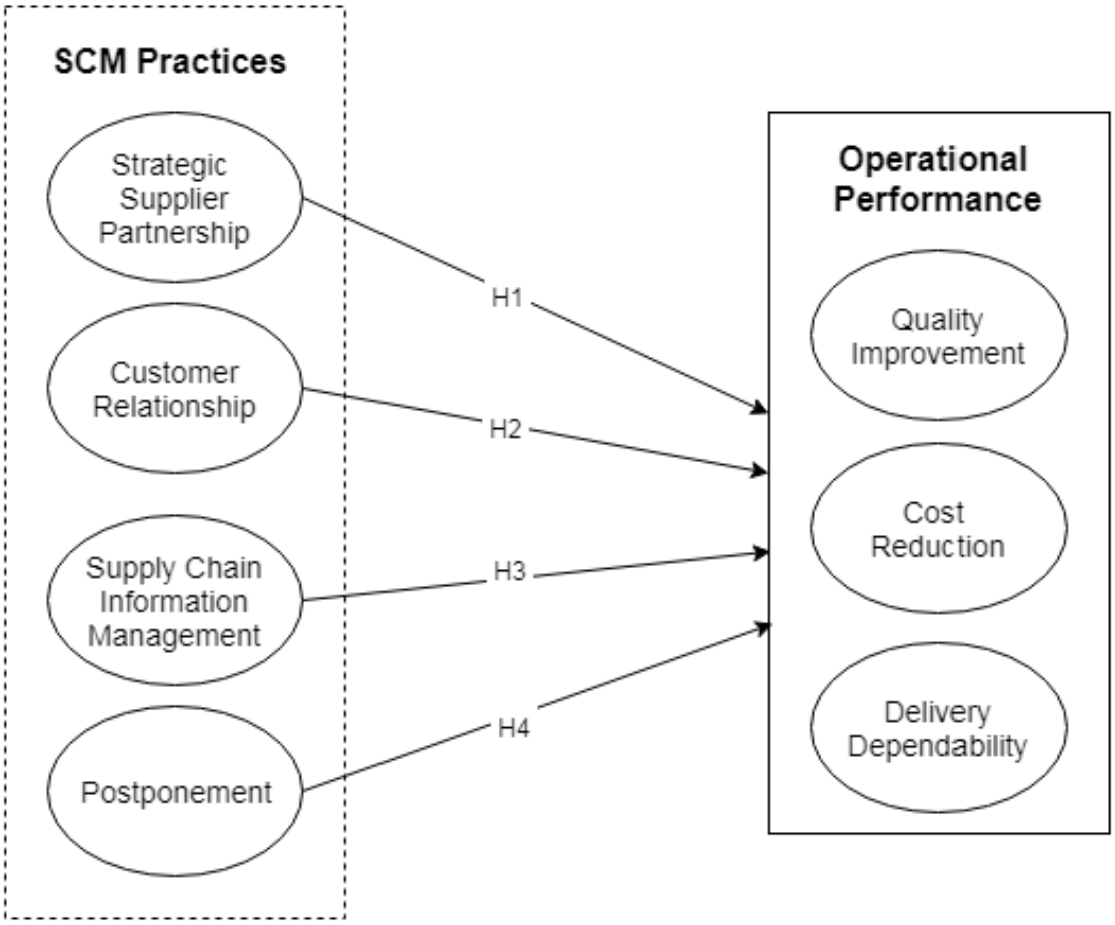

Fig. 1. Research model

2.5 Research Hypotheses

Strategic supplier partnership refers to the long term relationship between the organization and its suppliers. It is designed to leverage the strategic and operational capabilities of individual participating organizations to help them achieve significant ongoing benefits [7]. A strategic partnership emphasizes direct, long-term association and encourages mutual planning and problem solving efforts. Such strategic partnerships are entered into to promote shared benefits among the parties and ongoing participation in one or more key strategic areas such as technology, products, and markets. Strategic partnerships with suppliers enable organizations to work more effectively with a few important suppliers who are willing to share responsibility for the success of the products. Entering into strategic partnerships with suppliers allows both parties to collaborate and work towards reducing stock-outs, minimizing waste, reducing costs, and meeting delivery schedules [2,25]. This leads the researchers to hypothesize that:

H1: Higher levels of Strategic Supplier Partnership lead to higher levels of Operational Performance

Customer relationship comprises the entire array of practices that are employed for the purpose of managing customer complaints, building long-term relationships with customers, and improving customer satisfaction. Daugherty et al. [26] stated that competitive advantage can be achieved by creating value to immediate downstream customers and their customer and ultimately to the end user. Firms can also enhance their operational performance in terms of speed/delivery accuracy if they involve customer on issues such as quality and material flows. Good communication with customers will also enable the organization meet the needs of their customers through innovation and mass customization [2]. Based on these arguments, it is expected that:

H2: Higher levels of Customer Relationship lead to higher levels of Operational Performance

Supply Chain Information Management examines the volume and quality of supply chain information shared between organizations and their partners [2]. Organizations are encouraged to share important supply chain information with supply chain partners to enhance the effectiveness of the supply chain and create value [18]. Modern technology has an important role to play in managing supply chains. Information systems help information to be communicated effectively between supply chain partners [7]. This would ultimately lead to improved performance and effective SCM [27]. The quality of information shared is equally important for achieving high operational performance. Quality of information sharing includes such aspects as the accuracy, timeliness, adequacy, and credibility of information exchanged [2]. Literature is replete with examples of the dysfunctional effects of inaccurate/delayed information, as information moves along the supply chain. It is expected that:

H3: Higher levels of Supply Chain Information Management lead to higher levels of Operational Performance

Postponement is defined as the practice of moving forward one or more operations or activities (making, sourcing and delivering) to a much later point in the supply chain [15]. Postponement has been explored as a SCM practice in studies such as [7,19], and [15]. Postponement allows an organization to be flexible in developing different versions of the product in order to meet changing customer needs, and to differentiate a product or to modify a demand function. Keeping materials undifferentiated for as long as possible will increase an organization's flexibility in responding to changes in customer demand. In addition, an organization can reduce supply chain cost by keeping undifferentiated inventories [27]. Based on these arguments, it is hypothesized that:

H4: Higher levels of Postponement lead to higher levels of Operational Performance

2.6 Methodology

Measurement items for the constructs were sourced from pre-validated constructs from previous studies, with SCM items sourced from [7,15,19], and [2]. Operational Performance items were sourced from [23]. The items were modified slightly to suit the context of firms in the petroleum downstream. The items were then presented to two academics in SCM and three experienced operators in the petroleum downstream for further refinement. The inputs from these experts were inculcated into the

instruments design. The measurement items used in the study are presented in the Appendix.

Data for the study was obtained from firms operating in Ghana's petroleum downstream. Ghana petroleum downstream is one that has experienced tremendous growth in recent years and witnessed rapidly adoption of SCM practices [8]. A survey of firms operating in Ghana's petroleum downstream was conducted. These included Oil Trading Companies, Bulk Distribution Companies, Oil Marketing Companies and Liquefied Petroleum Gas Marketing Companies. A list of firms operating in the petroleum downstream was obtained from Ghana's National Petroleum Authority, the regulatory body for firms operating in Ghana's petroleum downstream. In all, 150 firms were selected at random for data collection. The prepared questionnaires were self-administered to each selected company, with the researchers targeting the head of the operations department/unit of the firm for data. Out of the 150 questionnaires administered, 78 were successfully retrieved. Data cleaning resulted in the dropping of 8 questionnaires, meaning a final sample of 70 firms was obtained, representing a response rate of 46.67%.

3. RESULTS AND DISCUSSION

3.1 Measurement Model Results

To assess the measurement model, we followed the guidelines proposed by [28]. First, indicator loadings were assessed to determine if they exceeded the minimum cut-off criteria of 0.708. This serves as an indication that the construct explains more than 50 per cent of the indicator's variance, thus providing acceptable item reliability. All items possessing factor loadings less than 0.708 were dropped, with the remaining items meeting this threshold as can be seen from the results in Table 1.

Next, the internal consistency reliability of the constructs was examined using the Composite Reliability and Cronbach Alpha values. Composite reliability values ranged from 0.894 to 0.962, whilst Cronbach Alpha values ranged from 0.805 to 0.940, both meeting recommended benchmarked thresholds of 0.7 [28]. The convergent validity of the constructs was then assessed. Convergent validity is the extent to which the construct converges to explain the variance of its items. The metric used for evaluating a construct's convergent validity is the

Table 1. Outer loadings

	COST	CR	DELV	IQ	POST	QUAL	SSP
COST1	0.924						
COST2	0.980						
COST3	0.930						
CR1		0.797					
CR2		0.925					
CR3		0.870					
DELV1			0.883				
DELV2			0.909				
DELV3			0.780				
IQ1				0.711			
IQ2				0.811			
IQ3				0.918			
IQ4				0.899			
IQ5				0.788			
PP2					0.912		
PP3					0.926		
QUAL3						0.879	
QUAL4						0.900	
QUAL5						0.841	
SSP3							0.952
SSP4							0.867

average variance extracted (AVE) for all items on each construct, with an AVE 0.50 or higher deemed acceptable. The AVE values ranged from 0.687 to 0.893, meeting this requirement. The summary of the tests for convergent validity are presented in Table 2.

Discriminant validity is the extent to which a construct is different from other constructs by empirical standards. This means a latent variable uniqueness displays different features from other constructs in the model. An examination of the cross-loadings of the indicators is a method for assessing discriminant validity. Particularly, an observed variable's outer loadings on related latent variables are expected to be higher when compared to other unobserved variables' outer loadings [28]. Examining Table 3 reveals that all items load higher on their own constructs than on other constructs, confirming discriminant validity.

Table 2. Attributes of constructs

Constructs	Cronbach's Alpha	Composite Reliability	AVE
Cost Reduction	0.940	0.962	0.893
Customer Relationship	0.840	0.899	0.749
Delivery Dependability	0.820	0.894	0.738
Supply Chain Information Management	0.888	0.916	0.687
Postponement	0.816	0.916	0.845
Quality Improvement	0.854	0.901	0.697
Strategic Supplier Partnership	0.805	0.907	0.830

Table 3. Item cross-loadings

	COST	CR	DELV	IQ	POST	QUAL	SSP
COST1	**0.924**	0.189	0.426	0.150	0.171	0.180	0.287
COST2	**0.980**	0.152	0.432	0.182	0.279	0.178	0.409
COST3	**0.930**	0.119	0.405	0.337	0.237	0.166	0.458
CR1	0.076	**0.797**	0.166	0.057	-0.008	0.051	0.209
CR2	0.245	**0.925**	0.241	0.180	0.104	0.157	0.337
CR3	0.065	**0.870**	0.317	0.196	0.100	0.240	0.378
DELV1	0.431	0.216	**0.883**	0.261	0.228	0.252	0.005
DELV2	0.440	0.348	**0.909**	0.397	0.194	0.243	0.243
DELV3	0.265	0.180	**0.780**	0.344	0.159	0.375	0.292
IQ1	0.187	0.081	0.224	**0.711**	-0.076	-0.025	-0.019
IQ2	0.155	0.284	0.269	**0.811**	0.119	0.064	0.053
IQ3	0.243	0.147	0.383	**0.918**	0.109	0.117	0.194
IQ4	0.233	0.140	0.395	**0.899**	0.125	0.148	0.137
IQ5	0.135	0.134	0.287	**0.788**	0.023	0.158	0.169
PP2	0.238	0.099	0.141	-0.061	**0.912**	0.101	0.270
PP3	0.210	0.072	0.270	0.211	**0.926**	0.041	0.053
QUAL3	0.044	0.201	0.294	0.067	0.107	**0.879**	0.123
QUAL4	0.223	0.203	0.293	0.127	0.067	**0.900**	0.343
QUAL5	0.249	0.222	0.307	0.180	0.044	**0.841**	0.278
SSP3	0.429	0.341	0.233	0.122	0.189	0.298	**0.952**
SSP4	0.286	0.349	0.117	0.154	0.104	0.181	**0.867**

Table 4. Fornell-Larcker test

	COST	CR	DELV	IQ	POST	QUAL	SSP
COST	**0.945**						
CR	0.162	**0.865**					
DELV	0.445	0.292	**0.859**				
IQ	0.235	0.186	0.388	**0.829**			
POST	0.243	0.093	0.226	0.087	**0.919**		
QUAL	0.185	0.193	0.333	0.125	0.076	**0.835**	
SSP	0.407	0.374	0.206	0.146	0.171	0.275	**0.911**

A second approach to assessing discriminant validity is the Fornell–Larcker criterion. It compares square root of AVE values with construct correlations. Particularly, the square root of each construct's AVE is expected to be higher when compared to the highest correlation of any construct [28]. Table 4 confirms that the square root of the constructs AVEs (bolded) are higher than correlations among constructs.

HTMT is the average of the heterotrait-heteromethod correlations (i.e., the correlations of indicators across constructs measuring different phenomena), relative to the average of the monotrait-heteromethod correlations (i.e., the correlations of indicators within the same construct) [29]. HTMT test approach indicates that HTMT values must be significantly less than 1, with a value of less than 0.85 ideal [29]. Table 5 indicates that the highest HTMT value is 0.503, confirming the model possesses adequate discriminant validity.

3.2 Structural Model Results

Having confirmed the soundness of the measurement model, the structural model was examined. The key criteria for the assessment included the coefficient of determination (R^2), the blindfolding-based cross validated redundancy measure (Q^2), and the statistical significance and relevance of the path coefficients [29].

The authors first assessed collinearity by examining the tolerance values of each predictor construct (VIF), with VIF values expected to range between 0.20 and 5. VIF values ranged from 1.047 to 1.195, indicating there was no collinearity among the predictor constructs in the structural model. The coefficient of determinant (R^2) signifies the accuracy of prediction of constructs in structural models. The PLS–SEM technique aims at maximizing the R^2 values of endogenous latent variables in the path model. R^2 values are substantial, moderate and weak if their values are 0.75, 0.50 or 0.25, respectively [28]. The model shows fairly weak predictive accuracy value of 0.287 toward operational performance.

Predictive relevance (Q^2) value was also analyzed by running the blindfolding procedure to calculate cross-validated redundancy for endogenous latent variables to indicate the model's predictive relevance of an indicator. The resulting Q^2 values were larger than 0 and lower than 0.5, implying that there is a significant predictive relevance for the endogenous constructs under study. The path co-efficients and t-values for each of the SCM practices on Operational Performance are shown in Fig. 2 and Table 6.

The results revealed that Strategic Supplier Partnership had a positive and significant effect on Operational Performance as hypothesized, meaning that hypothesis 1 was supported. This supports previous studies such as [27] who observed significant effect of strategic supplier relationship on operational performance. Customer Relationship had a positive, but not statistically significant effect on Operational Performance, hence hypothesis 2 was not supported. This supports the findings of [15] who observed a positive but weak effect of customer relationship on supply chain performance. This suggests that whilst managing customer relationships is important, it is more likely to enhance financial and market performance of firms, not their operational performance. The study revealed that supply chain information management significantly enhances the operational performance of firms, confirming studies such as [7] and [11] which indicate that effective management of supply chain information has positive effects on performance. Finally, postponement did not have a significant effect on operational performance. This finding confirms the findings of [15] who observed a positive but weak effect of postponement on supply chain performance of firms.

Table 5. HTMT test

	COST	CR	DELV	IQ	POST	QUAL	SSP
COST							
CR	0.170						
DELV	0.503	0.335					
IQ	0.252	0.203	0.440				
POST	0.277	0.109	0.272	0.181			
QUAL	0.191	0.220	0.399	0.156	0.092		
SSP	0.449	0.434	0.261	0.175	0.215	0.299	

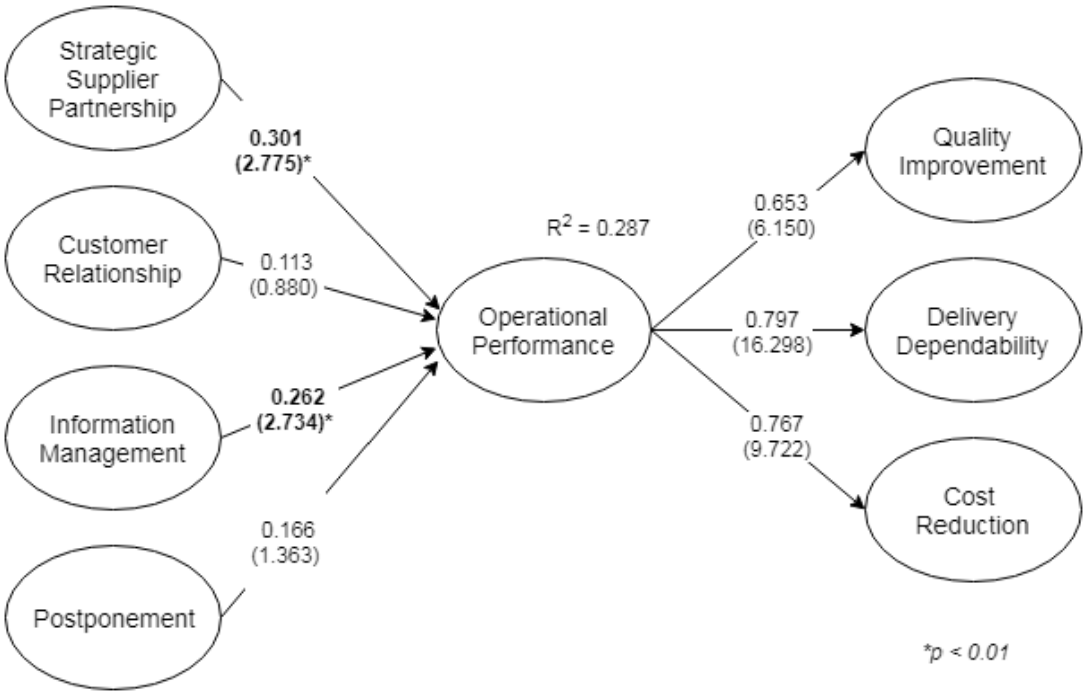

Fig. 2. Structural model results

Table 6. Summary of research hypotheses

Hs	Hypothesized path	Path co-efficient	T Statistics	P Values	Decision
H1	Strategic Supplier Partnership → Operational Performance	0.301	2.775	.006	Supported
H2	Customer Relationship → Operational Performance	0.113	0.880	.379	Not supported
H3	Supply Chain Information Management → Operational Performance	0.262	2.734	.006	Supported
H4	Postponement → Operational Performance	0.166	1.363	.173	Not supported

4. CONCLUSION

This study examined the effect of SCM practices on the operational performance of firms operating in the petroleum downstream, a hitherto unexplored subject. The study found that strategic supplier partnership and supply chain information management have positive and significant effects on operational performance. However, the effects of customer relationship and postponement on operational performance were not significant.

There are some implications of the study for research and practice. For research, firstly, the study provides insights into the effect of SCM practices on operational performance in a hitherto unexplored context, that is, among firms in the petroleum downstream. Thus the study contributes to literature by providing context-specific insights into the effects of SCM practices on performance. The study establishes strategic supplier partnership and supply chain information management as important SCM practices that enhance the operational performance of firms in the petroleum downstream. The study also establishes that within the context of the study, an emerging Sub-Saharan African country, SCM practices are important in driving operational performance within the petroleum downstream sector. This is important because given the unique and sometimes disruptive Sub-Saharan African environment, the results of SCM initiatives in the region may be different from

what may be seen in developed regions as suggested in previous studies [8,30,31]. By way of implication for practice, given that the findings of the study indicate that strategic supplier relationship and information management are SCM practices that directly enhance the operational performance of firms in the petroleum downstream, firms in the petroleum downstream seeking to enhance their operational performance should work on improving their relationships with their suppliers and the volume and quality of supply chain information shared with supply chain partners.

There are some limitations to the study. First, the context of the study was limited to firms in the petroleum downstream, consequently the findings of the study may not hold through for firms in other industries or contexts. Additionally, the study only explored the effect of SCM practices on operational performance. Further studies are needed to explore how SCM practices influence financial and market performance of firms in the petroleum downstream. Studies exploring the subject matter from other regions may provide useful information for a comparative study on how SCM practices influence operational performance in different regions. Future studies can also explore how other SCM practices impact the performance of firms in the petroleum downstream.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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APPENDIX

Measurement items

Supply chain management practices

Strategic supplier partnership
SSP1: We consider quality as our number one criterion in selecting suppliers
SSP2: We regularly solve problems jointly with our suppliers
SSP3: We have helped our suppliers to improve their product quality
SSP4: We have continuous improvement programs that include our key suppliers
SSP5: We include our key suppliers in our planning and goal-setting activities
SSP6: We actively involve our key suppliers in new product development processes

Customer relationship
CR1: We frequently interact with customers to set reliability, responsiveness, and other standards for us
CR2: We frequently measure and evaluate customer satisfaction
CR3: We frequently determine future customer expectations
CR4: We facilitate customers' ability to seek assistance on our products from us
CR5: We periodically evaluate the importance of our relationship with our customers

Supply chain information management
IQ1: There is timely exchange of information between us and our trading partners.
IQ2: There is accurate information exchange between our trading partners.
IQ3: There is complete information exchange between our trading partners.
IQ4: There is adequate information exchange between our trading partners.
IQ5: Information exchange between our trading partners and us is reliable.

Postponement
PP1: Our products are designed for modular blending.
PP2: We delay final product blending activities until customer orders have actually been received.
PP3: We delay final product blending activities until the last possible position (or nearest to customers) in the supply chain.

Operational Performance

Quality Improvement
QUAL1: Products that do not meet the quality specifications have reduced.
QUAL2: We have superior quality of products compared to our competitors
QUAL3: Activities in fixing defective products to conform to the quality specifications (reworks) have reduced
QUAL4: Poor quality products that must be discarded (scraps) have reduced.
QUAL5: The percentage of product that passes final inspection the first time (first-pass quality yield) has increased.
QUAL6: We have superior quality of service compared to our competitors

Delivery Dependability
DELV1: Our ability to deliver products to the market quickly has increased.
DELV2: Our ability to deliver products to the customer as promised has increased.
DELV3: We are capable of delivering products to the market faster than our competitors.

Cost reduction
COST1: Importation cost has reduced
COST2: Distribution cost has reduced.
COST3: Storage cost has reduced.

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