

# **RISK REDUCTION STRATEGIES AND SUPPLY CHAIN RESILIENCE IN THE PETROLEUM INDUSTRY IN KENYA**

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## **Abstract**

*Supply chain resilience is critical for the firms operating in the modern day petroleum sector. Crude oil supply fluctuations have often caused the price of the product to vary. Also, cases of fuel adulteration have occasionally caused some oil dealers to face problems with their customers. In addition, demand supply fluctuations have caused shortages diminishing revenues for fuel dealers. All these risks among other unforeseen disruptions have had adverse effects to petroleum firms in achieving operational efficiency, maintaining quality, profitability and customer satisfaction. For that reason, proactive steps to reduce such risks and develop plans to return the firm to its original position is important. This study investigated the influence of risk reduction strategies on supply chain resilience in the petroleum industry in Kenya. Using descriptive methods, specifically the regression analysis to analyze data obtained through self-designed structured questionnaires from the active 87 registered oil marketers, the study established a weak, positive but statistically significant*

*relationship between risk reduction and supply chain resilience. The study concludes that there is a need to establish adequate buffers, collaborate with other entities and allowing flexibility to enhance supply chain robustness and agility.*

*Keywords: Risk Reduction, Strategies, Supply Chain Resilience, Petroleum Industry*

## **INTRODUCTION**

The role of supply chain risk management in firms within the petroleum industry cannot be overstressed. The sector faces numeral supply chain risks due to fluctuations in demand and supply of the crude oils and other manmade and natural disruptions. In the Kenyan context, the sector has been marred with many supply shocks and hence price fluctuations which have badly hit the profits for the companies in the sector. Herrera (2013) argues that while the sector is assured of demand for its products because most petroleum products are basic goods for provision of energy, the supply side is not always assured because of complexity of transport infrastructure requirements and associated costs. That calls for appropriate strategies to minimize the risks for the organizations to realize revenues and profitability (Spacey, 2015).

A resilient supply chain infrastructure is needed for petroleum dealers to efficiently and effectively obtain the important commodity and provide the same to the consumers (Carvalho et al., 2014). Reducing risk of occurrence and enhancing the supply chain resilience so as to recover in case of unforeseen disruptions is key. For that purpose, Kwak (2014) argued that buffering, collaborations and flexibility are essential strategies to benefit the organizations in the sector in order to realize resilient supply chains in the petroleum sector. Risk reduction strategies involves organizations putting in place adequate buffer stock, developing collaborative networks with other industry players and availing mechanisms that provide operational flexibility in the midst of the supply chain uncertainties.

### **Risk Reduction and Supply Chain Resilience**

Spacey (2015) defines risk reduction as either absolute or relative reduction of possibilities of supply chain disruption as well as associated consequences of such occurrences. Behdani (2013) opine that risk reduction entails minimization of severity of disruptions. It entails taking early actions to minimize probability of occurrence or reduction of potential impacts of supply chain uncertainty should the unexpected actually occur. According to Kwak (2014) risk reduction can take the form of vertical or horizontal integration to ensure while Behdani (2013) posit that

buffering, collaboration and flexibility mechanisms can benefit an organization to enhance supply chain robustness.

On the other hand, Carvalho *et al.* (2014) defines supply chain resilience as a supply chain's readiness, effectiveness to, and recovery from disruptions to reach previous level. Hohenstein *et al.* (2015) adds to this definition and states that resilient supply chains are those that can attain their previous level and preferably higher or better levels of operational performance. Therefore, robustness and agility are essential ingredients for supply chain resilience. Robustness refers to the proactive anticipation of potential adverse changes and being prepared to maintain a stable situation that is resistant to occurrence of those changes (Hohenstein *et al.*, 2015). On the other hand, agility is the reactive capacity of a firm in order to attain speedy recovery from shocks and to attain the stable situation (Wieland & Wallenburg, 2013).

Consequently, firms that have built mechanisms to minimize possible occurrence of supply shortages and associated costs on one side and demand and price fluctuations on the other can be said to be resilient. Empirical literatures by Cheng'e (2014), Urciuoli *et al.* (2014) and Udbye (2014) point out that firms can build robust and agile supply chain frameworks that can manage to handle uncertainties of supply, demand, price, transport and infrastructural costs turbulence by building mechanisms that can reduce potential disruptions. The objective of this paper is to determine the influence of Risk Reduction strategies on Supply Chain Resilience in the Petroleum Industry in Kenya.

## LITERATURE REVIEW

According to Rajesh, Ravi and Rao (2014) adoption of proactive risk management approaches is not an option for organizations in the petroleum sector, it is an essential ingredient for competitive advantage and longevity. Consistent with that Giunipero *et al.* (2015) argues that supply chain resilience of a company can have a positive influence on an organization's product and service delivery quality, attaining customer satisfaction and competitiveness in the market. In the petroleum industry, assurance to the customer that they can get the product in the quantities they need is essential for customer loyalty and retention (Biljana, 2011). Prevalent shortages or price rise due to supply chain fluctuations would reduce customer's confidence in their supplier.

Since the firms in the petroleum sector provide their products and services to individuals and organizations, it is imperative for the firms in the sector to sustain the needs of the consumer of their products (Onwonga, 2013). That is possible if petroleum dealers can build robust and agile supply chain frameworks that can substantially reduce occurrence of supply

disruptions and the effects associated with the disruptions. Therefore, there is a need to create buffers in case of shortages, collaborate with other market players and develop flexibility such that the personnel can switch to alternative suppliers in order to meet the demand when their usual supplier is not in a position to meet the requirement. Lopo *et al.* (2013) maintain that supply chain resilience should eliminate possible shortages but quality assurance is critical element of robustness because it helps the organization to maintain quality supplies to its customers.

With the increasing problems of adulteration of fuels and other petroleum products, the players in the industry need to source for the right suppliers and make appropriate mechanisms to reduce probability of obtaining adulterated products. According to Buchanan (2012), Onwonga (2013) and Barasa (2016) note that in order to obtain, stock and deliver petroleum products that meet consumer needs, there is need to create arrangements to detect all elements of sub-standards. While noting the emergence of petroleum product adulterations, Barasa (2016) opine that the most appropriate way to minimize risk of supply chain resilience in terms of product quality is to avoid possible quality deterioration agents. For instance, strict evaluation of suppliers' quality and capacity to deliver and reliance on only those suppliers who they have trust in and continuous checks in close collaboration with allies can enhance a firms supply chain robustness. However, adequate buffer to act as back up flexibility are important for adequacy, resilience and agility in times of delay and fluctuations (Tech & Cole, 2016). Those strategies serve to reduce supply chain risk which in this study is hypothesized to cause supply chain resilience.

## **METHODOLOGY**

The current study sought to determine the influence of risk reduction strategies on supply chain resilience. The study followed descriptive design to collect data and test the hypothesis that risk reduction strategies have a positive influence on supply chain resilience in the petroleum industry in Kenya. The data was obtained from the 87 active registered oil marketing companies in Kenya as at July 31<sup>st</sup> 2017. The data was obtained through self-designed structured questionnaires where the respondents rated various Likert-type questions regarding the state of the organization on issues risk reduction strategies and supply chain resilience in their company. The target employees in the companies were the Depot Managers and Supply Chain/Logistics Managers. The data was analyzed using SPSS to obtain correlation coefficient and the coefficient of determination to indicate the nature and strength of the relationship. The hypothesis was tested using p-value at 5 percent significant level.

## ANALYSIS AND RESULTS

The results of the analysis are as shown in table 1 below. The study results indicated that there is a positive relationship between risk reduction strategies employed and supply chain resilience of the analyzed oil marketing companies because the correlation coefficient denoted as  $R$  was 0.293. Although the relationship is positive, the coefficient of determination denoted as  $R$ -Square which was 0.086 denotes weak causation. In other words, the risk reduction strategies, though have a positive influence on supply chain resilience, the relationship is weak. However, significant value for this causation was 0.031, which is less than 0.05. Therefore, there is a statistically significant relationship between the risk reduction strategies and supply chain resilience of oil marketers in Kenya.

Table 1: Regression Analysis Results

<b>Model Summary</b>					
Model	R	R Square	Adjusted R Square		
1	.293 <sup>a</sup>	.086	.060		
a. Predictors: (Constant), LnRisk_Reduction					
<b>Coefficients<sup>a</sup></b>					
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	3.529	0.779		4.532	0
LnRisk_Red	0.497	0.228	0.181	2.182	0.031
a. Dependent Variable: Supply Chain Resilience					

## DISCUSSION AND CONCLUSION

Attaining supply chain resilience in a sensitive sector like petroleum industry requires meticulous efforts of planning. While diverse actions has to be put into place to have supply chain systems that a robust to hinder possibility of supply bottlenecks and to attain systems that are agile to retrace the organization back to where it was before the unexpected destructive events occurred. Although the results indicated weak causation, the positive relationship which is statistically significant indicates the importance of risk reduction on the supply chain resilience in the oil marketing companies. Buffering, collaboration and flexibility are essential ingredients to attainment of supply chain robustness and agility. Collaboration is akin to networking building supply chain networks (*Wang et al., 2015*), buffering cushions the firm against potential

disruptions while flexibility is synonymous with options to take in times of disruptions (Tech & Cole, 2016).

In conclusion risk reduction through buffering, collaborations and creating options for flexibility is an essential step towards attainment of the supply chain resilience in the petroleum sector. Whether a company attains absolute or relative supply chain risk reduction, the action positively influences supply chain robustness and agility by reducing chances of disruptive occurrences and make it possible for the entity to revert back to its original operative capacity. Nonetheless, it is better to reduce probability of occurrence of exposures rather than struggle in bid to repair the damage after the unexpected outcome has occurred.

Apart from buffering, collaboration and flexibility capabilities, a review of petroleum chain infrastructure, wide consultations and interaction among industry players, redesign for customer, construction of more storage facilities, and color coding of export petroleum products as well as making steps to curb adulteration are essential steps for creating supply chain resilience. Furthermore, relevant strategies to reduce exposures and build supply chain resilience including portfolio diversification, negotiating for flexible contracts, transport capacity planning and safety stocks are important for robust and agile supply chain framework in the petroleum industry.

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