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INFLUENCE OF SUPPLY CHAIN RESILIENCE ON PERFORMANCE OF CATEGORIZED HOSPITALS IN KENYA

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ABSTRACT: *The study sought to establish the relationship between supply chain resilience and performance of categorized hospitals in Kenya. The study sampled 264 supply chain managers from 773 hospitals offering both inpatient and outpatient services in Kenya as listed by National Hospital Insurance Fund (NHIF). The sampling technique was stratified random sampling based on the eight regions as identified by NHIF. The study adopted Data Envelopment Analysis (DEA) model to measure performance of hospitals. The study findings indicated that private hospitals had a higher DEA score compared to the public and faith based hospitals. The findings implied that private hospitals were generally efficient than other type of hospitals. Further, the study found that supply chain resilience had a positive significant relationship with performance. The study recommended the use of outsourcing, spare capacity, and use of local suppliers to mitigate against hospital operational risks.*

KEYWORDS: Supply Chain, Resilience, Performance, Hospitals, Risks.

INTRODUCTION

Six million children around the world die each year due to lack of quality and affordable health care (UNDP, 2016). The attainment of quality and affordable healthcare is dependent on the ability of the healthcare organizations to promote resilience and mitigate against operational and quality risks through support of dynamic capabilities that reduce negative impact of supply chain instability and disruptions (Krishnan & Pertheban, 2017). Resilience is a multi-faceted dynamic capability meaning that resilience acts as the dynamic capability by which firms integrate, build and reconfigure internal and external competences that can sustain firm performance (Eltantawy, 2016). Resilience is the ability of a system to return to its original state or move to a new, more desirable state after being disturbed (Lenort & Wicher, 2012). Resilience, in an organizational sense has been defined as the ability to survive and thrive in crises and turbulences (Fisher, 2017). Pal (2013) noted that SC resilience is associated with established activities like crisis management (CM) and business continuity plans (BCP) by establishing better short-term CM through higher operational flexibility and better long-term strategies through BCP, along with growth strategies via market penetration, diversification and transformational initiatives.

Academic and practitioner interest in resilience has been largely driven by escalating business vulnerabilities and disruptions by both external factors such as legislative and environmental vulnerabilities and internal factors such as financial and internal business-process vulnerabilities (Krishnan & Pertheban, 2017). Point to note therefore is that the key driving force of resilience is disruption. The disruptions in a supply chain can be classified as either internal to the firm (process and control risks), external to the firm but internal to the supply chain network (demand and supply risks) and external to the network (environmental risks) (Pal, 2013). Organizations cope with disruptions either reactively or proactively. Reactive strategy implies that the supply chain adjusts ex-post to changes, and supply chains adopting

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this strategy are usually referred to as agile supply chains (Durach, Wieland, & Machuca, 2014). Proactive strategy on the other hand implies that the supply chain implements ex-ante measures to cope with turbulence, with no adaptation needed during times of change. Supply chains that adopts this strategy are usually referred to as robust supply chains (Vlajic, van der Vorst, & Haijema, 2012). Supply chain resilience balances both reactive and proactive strategies such that a resilient SC is both adaptable and robust (Saenz & Revilla, 2014). Agility and robustness are therefore dimensions of resilience (Wieland & Wallenburg, 2012).

The other face of resilience is alignment. Ishaq, Khaliq, Hussain and Waqas (2012) termed the three resilient dimensions as triple A strategies of supply chain excellence. Alignment refers to a combination of internal resources, technologies and processes to fit institution to better deal with existing and upcoming environmental issues (Rodrigues, Vivan, & Storopoli, 2016). Aligned SC partners take care to align the interests of all the firms in their supply chain with their own. If any company's interests differ from those of the other organizations in the supply chain, its actions will not maximize the chain's performance (Sakka, Millet, & Botta-Genoulaz, 2011). Organizations excel in alignment by implementing three strategies; Alignment of information so that all SC partners have equal access to forecasts, sales data, and plans; Alignment of identity by clearly defining the role and responsibilities of the partners; Alignment of incentives through creation of risk cost and reward sharing scheme (Ishaq, Khaliq, Hussain, & Waqas, 2012).

Though research about supply chain resilience is extensive, most studies are general, conceptual, theoretical and normative and only few studies provide set of specific strategies to improve supply chain resilience in a specialized industry (Tukamuhabwa, Stevenson, Busby, & Zorzini, 2015). Few studies focus on the improvement of supply chain resilience in healthcare industry. Further, there has been limited use of theory frames to improve understanding and relate theory with practicality of the concept. Only few scholars have addressed the antecedents that provide favorable environment for supply chain resilience to exist and more so generate superior performance compared to competitors (Kim, Song, & Nerkar, 2012). This research will bridge this gap by prescribing specific supply chain strategies that can support supply chain resilience in healthcare industry and enhance performance improvement of healthcare institutions.

The international practice of measuring performance of hospitals is based on the two main objectives of costs and quality of care (Mayer, 2013). Costs as a measure can be operationalized by the level of productivity or efficiency of services provided in the hospital. Measure of productivity of hospitals take into consideration the input and output measures and their relationships (Chansky, Garner, & Raichoudhary, 2013). DEA (Data Envelopment Analysis) model is the most common technique used to measure efficiency and optimum performance of hospital (Caballer-Tarazona, Moya-Clemente, Vivas-Consuelo, & Barrachina-Martinez, 2010). DEA is simply calculated as the total weighted output divided by the total weighted input (Ozcan, 2014). The output measure of productivity in the study is based on the total hospital revenues. Total hospital revenues are the total cash inflows of the hospital within a given time period (Chansky, Garner, & Raichoudhary, 2013). The input measure of hospital productivity include the resources used such as labor hours (total number of staff hours), total expenditure and medical supplies (Ozcan, 2014). The study will adopt DEA as the measure of efficiency of hospitals with total revenues as output measure and total expenditure as total inputs.

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Statement of the Problem

Kenya has for decades been struggling to build a health system that can effectively and efficiently provide quality health services to its population (Turin, 2010). However upto date healthcare provision is still a national challenge. The infant mortality rate is about 58.1 per 1,000 live births. The overall under-5 child mortality rate is about 121 per 1,000 live births, which is double of the global average and maternal mortality rate is about 414 per 1,000 (ROK, 2014). Kenya has high morbidity and mortality rates affecting the population of all ages, especially children under-5. Though a significant proportion of this morbidity and mortality can be attributed to spread of infectious conditions, poverty and chronic diseases, hospital management factors such as lack of a robust supply chain network, poor inventory and resource management and human resource factors have a significant effect on the quality and affordability of healthcare service (Mohajan, 2014).

Kenya healthcare system is heavily financed by donors and private sector. The government expediture on health is only 5.7% of the national budget and the government relies on external donors to finance 75% of their national programs (Luoma, et al., 2010). Donations are unreliable and geared towards fulfilling donor project objectives which may not always be the real need of the population. Accountability and transparency on the utilization of donor funding is also a major issue in Kenya. These myriad of factors results in hospitals being unable to ensure continuous supply of services, support healthcare decentralization and overcome supply chain and financial challenges. The management problem is not confined to public hospitals only. Forty percent of private hospitals have a challenge of accessing finance for expansion and innovation unlike public hospitals which receive government allocation and donor funding (Burger, Kopf, Spreng, Yoong, & Sood, 2012). Private hospital entirely depend on the owners equity and hospital revenues. Poor resource availability in private hospitals limit the scope, agility, robustness and quality of their operations.

The study postulates that lack of robust and agile supply chain networks have contributed to performance challenges in hospitals in Kenya. The objective of the study is therefore to assess the importance of improving hospital performance through promoting and enhancing supply chain resilience. Since 45% of the hospital operating budget is allocated to supply chain, improvements and innovations in supply chain management may provide significant impact on cost, quality and performance of heathcare (Chen, Preston, & Xia, 2013). The study will provide valuable findings to hospitals administration, policy makers and other health institutions managers on the importance of promoting supply chain resilience as a means of enhancing institutional performance.

Objective

The main objective of the study will be to examine the influence of supply chain resilience on performance of categorized hospitals in Kenya.

THEORETICAL AND LITERATURE REVIEW

Relational competence theory (RCT) developed by protagonists Hamel and Prahalad, (1994) and Sanchez, Heene and Thomas (1996) among others is an improvement of the theory of the firm and resource based view and attempts to explain performance differences among organizations. According to RTC, an organization can only be successful if it can make use of

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the available resources more efficiently or effectively than the other organizations. This is achieved by developing and effectively or /and efficiently utilizing competences that cannot be quickly imitated or substituted by rivals. RCT defines competence as drivers of a single firm's heterogeneity and are heterogeneous by themselves. Competences are capabilities that build resources through asset refinement processes and utilize these resources to achieve competitive advantages (Sanchez, 2001).

According to RCT assets are homogeneous external or internal factors, serving the firm as input for value-added processes which when developed becomes resources capable of producing sustainable heterogeneity of the owning firm in competition and enabling the firm to withstand competitive forces, disruptions and risks. Competences are organizational, learning-based abilities that are capable of sustaining a coordinated deployment of assets and resources thereby enabling the firm to attain its goals and preserve the state of competitiveness. Competences can therefore be regarded as the root of organization's survival, competitiveness, and performance (Freiling, 2004).

RCT also developed the notion that competencies are interpersonal patterns of action which results in division of work and support goal oriented social interaction of persons in a non-random manner. Development of competency requires a specific or organizational environment which fosters assets refinement process. Organization is one solution to this problem. An organization is created if a group of individuals agree that working together would improve their economic situation and if there is no better alternative. RCT is in line with isolating mechanisms theory by Dierickx and Cool (1989) which explains how firms can 'outpace' their rivals by active behavior (i.e. by accumulating R&D knowledge via a well-aligned interplay of different researchers for many projects, triggering off synergies although having idiosyncratic backgrounds while also 'protecting' themselves in case of competitors' attacks by accumulate resources (i.e., reputation, brand equity, customer base) faster than the first-moving firm in order to catch up with this supplier. Following this theory the study will assess the role of resilience in promoting performance.

Empirical Review

Krishnan and Pertheban (2017) investigated the influences of supply chain resilience strategies on supply chain ambidexterity as a dynamic capability. In detail, the study sought to investigate how firms' SC ambidexterity was developed through a dynamic capability-building process and how ambidexterity can mitigate the negative impact of SC disruptions and improve business performance. The study collected data from a sample of 164 medium manufacturing SMEs operating in Malaysia. The study found that a dynamic SC resilience capability-building process is an antecedent of SC performance. The study identified inventory management, visibility, predefined decision plan and diversification as dynamic SC resilience capabilities.

Similarly, Rodrigues, Vivan and Storopoli (2016) researched on the ways to model higher education institutions to enhance their attractiveness and withstand global environment. The study used a theoretical framework approach. The study aimed at analyzing ways of creating resilience as a way of generating institutional attractiveness. The study found that institutional attractiveness can be build through resilience by internally aligning resources, capacities and processes.

Todo, Nakajima and Matous (2015) examined how supply chain networks affected the resilience of firms to the Great East Japan Earthquake, particularly looking at the effects on the

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time period before resuming operations after the earthquake and sales growth from the pre- to the post-earthquake period. The results indicated that the expansion of supply chain networks had two opposing effects on the resilience of firms to disasters. On one hand, when firms were connected with more firms through supply chain networks, they were more likely to experience disruptions in supply and demand, which delayed recovery. On the other hand, firms benefited from diversified networks with suppliers and clients because they would substitute the surviving firms in the network for the damaged partners and receive support from them. The study indicated that the latter positive effect on recovery exceeded the former's negative effect for many types of network, implying that diversified supply chain networks led to the resilience of firms to natural disasters.

Aigbogun, Ghazali and Razali (2014) sought to develop a framework to enhance supply chain resilience. The study aimed at investigating the vulnerabilities and the capabilities of the Malaysian pharmaceutical manufacturing supply chain by interviewing key supply chain personnel of seven Pharmaceutical companies with large manufacturing capacities in Malaysia. The study developed a framework with 4 dimensions of supply chain vulnerabilities (Turbulence, external pressures, sensitivity and connectivity) and 6 dimensions of supply chain capabilities (flexibility, visibility, adaptability, collaboration, reserve capacity and supplier dispersity). Also, Wieland and Wallenburg (2012) analyzed data collected from 270 manufacturing managers to identify the effect of robustness and agility strategies on business performance. They found that robustness has a direct, strong positive effect on business performance, whereas only an indirect effect of agility could be shown. The study recommended that organizations need to consider robustness and agility due to their primary importance to withstand everyday risks and exceptions.

Wasike (2014) examined the relationship between information systems and supply chain agility in service industry. The study adopted a case study design and collected data from 96 top, middle and lower level staff of the Technical University of Kenya. The study found that information system was critical on improvement of supply chain agility and resilience. The study recommended that resources (people, machines and the necessary application software) must be available to promote supply chain resilience. Also, investment in training and development of staff as well as incorporation of modern IT processes such as cloud computing will greatly improve university supply chain agility.

RESEARCH METHODOLOGY

The study used a cross-sectional and descriptive research design. The design was appropriate because it was useful in establishing the nature of existing situation and current conditions and also in analyzing such situations and conditions. This study used positivism research philosophy. Positivism research philosophy reflects the belief that reality is stable. Positivists believe that reality is stable and can be observed and described from an objective viewpoint without interfering with the phenomena being studied. The target population for the study was all hospitals in Kenya offering both inpatient and outpatient services as listed by National Hospital Insurance Fund in Kenya (NHIF). According to NHIF (2017), there were 773 hospitals offering both inpatient and outpatient services in Kenya and accredited to provide inpatient medical insurance cover for their patients. These hospitals formed the target population and were the unit of analysis in the study. The unit of analysis was the public and private hospitals in Kenya offering both inpatient and outpatient services as listed by the NHIF.

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The unit of observation on the other hand was the overall procurement or supply chain manager in either public and private hospitals in Kenya offering inpatient and outpatient services as listed by the NHIF.

The sampling frame for this study was the hospitals listed by NHIF as offering both inpatient and outpatient services for the year 2017. The study used stratified random sampling technique to select a sample of 264 hospitals in Kenya. The study used both primary and secondary data. Primary data was obtained from a structured questionnaire while secondary data was quantitative data on hospital performance which was sourced from the hospitals annual reports, pamphlets, office manuals circulars, policy papers, corporate or business plans as well as survey reports from Ministry of health and Kenya National Bureau of Statistics. The researcher made use of research assistants who were adequately trained prior to questionnaire administration.

Research Findings

The study sought to collect data from 264 supply chain managers of hospitals in Kenya. However, the study managed to collect data from 216 key respondents and 48 respondents were non-responsive. Therefore, the study realized a response rate of 82%. This response rate is good in accordance to Garg and Kothari (2014) who posited that a response rate of more than 70% is good to conduct data analysis. The general information sought in the study was the type of hospital and the bed capacity of the hospitals. The bed capacity was used to measure the mediating variable, size, while the type of hospital was used to access the legal form of the hospitals studied.

The findings obtained indicated that 50% of the hospitals were private, 29% were public and 21% were faith based hospitals. The findings imply that more private hospitals were sampled than the public and faith based hospitals, which show generally that there are more private hospitals than faith based and public hospitals, in line with NHIF (2017). Further, the findings indicate that 71% of the hospitals had a bed capacity of 25-400, 21% had 1-24 beds and 8% had above 400 beds. The findings implied that there were more hospitals with a bed capacity of between 25 and 400 than those with more than 400 beds. The majority hospital sampled were therefore medium and big hospitals in Kenya. This is in line with ROK (2017) which indicated that there are more medium and big hospitals in Kenya compared to small hospitals. The findings are as shown in Figure 1.

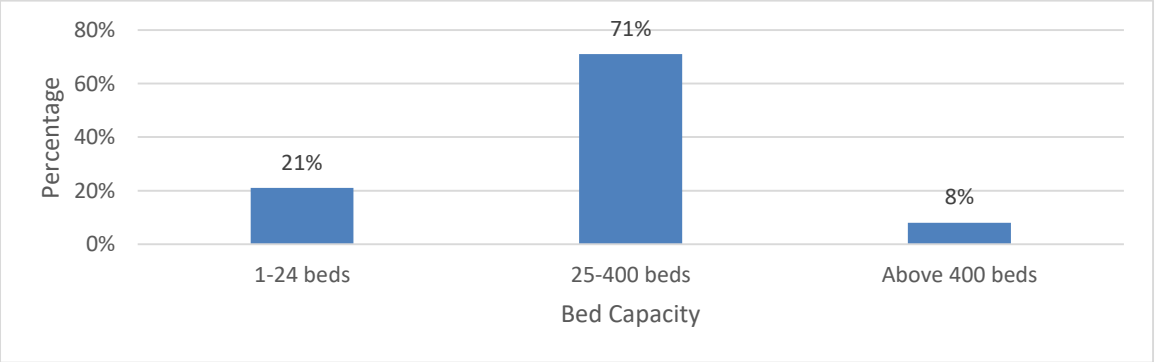

Figure 1 Bed Capacity

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DESCRIPTIVE FINDINGS

The relationship between supply chain resilience and performance of hospitals was sought in the study using means and standard deviations. Means and standard were used to descriptively analyze the findings. The means were interpreted as follows; a mean value of 0-1 implied the majority of the respondents agreed to the statements to a very small extent, a mean value of 1.1-2.0 implied the respondents agreed with the statements to a small extent, a mean value of 2.1-3.0 implied the respondents neither agreed nor disagreed with the statements, a mean value of 3.1-4.0 means that the respondents agreed to the statements to a great extent and a mean of 4.1-5.0 implied the respondents agreed with the statements to a very great extent.

The findings indicate that the mean values obtained for the majority of the items were above 3.0 indicating that the majority of the respondents agreed with the statements. The study findings indicate that majority of respondents agreed to a very great extent that hospitals used different payment platforms (M = 4.04, SD = 1.042). The respondents agreed to a great extent to the following statements: The hospital has clear roles and responsibilities to minimize conflict (M = 3.75, SD = 1.359); the hospital uses multiple sourcing of goods and services (M = 3.71, SD = 0.999); and the hospital has adequate capacity to mitigate against demand and supply variation (M = 3.54, SD = 1.062). However, the respondents neither agreed nor disagreed that hospitals encouraged the use of local suppliers (M = 2.67, SD = 1.341). The findings are shown in Table 1.

Table 1: Descriptive Statistics on Supply Chain Resilience and Performance

	N	Mean	Std. Deviation
The hospital has adequate capacity to mitigate against demand and supply variations.	216	3.54	1.062
The hospital has an efficient logistics system.	216	3.25	.944
The hospital has process back up plans and systems	212	3.41	1.563
The hospital uses multiple sourcing of goods and services.	216	3.71	.999
The hospital encourages the use of local suppliers.	216	2.67	1.341
The hospital uses different payment platforms	216	4.04	1.042
The hospital has clear roles and responsibilities to minimize conflict	216	3.75	1.359
The hospital has an equal access to information, data and plans across all departments and across all strategic partners	210	3.59	1.260
The hospital continuously assesses the needs of immediate and ultimate customers.	212	3.50	1.144

The findings agree with those of Rodrigues, Vivan and Storopoli (2016) who found that institutional attractiveness can be build through resilience by internally aligning resources, capacities and processes. Similarly, Todo, Nakajima and Matous (2015) agree that firms benefited from diversified networks with suppliers and clients because they would substitute the surviving firms in the network for the damaged partners and receive support from them. In addition, Wieland and Wallenburg (2012) found that robustness has a direct, strong positive effect on business performance and recommended that organizations need to consider robustness and agility due to their primary importance to withstand everyday risks and exceptions.

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Results on Performance of Hospitals

Performance in the study was measured using four constructs namely total inventory expenditure, total wage bill, income from outpatient and income from inpatients. Data Envelopment Analysis (DEA) model was used to measure efficiency and optimum performance of the hospitals. DEA is simply calculated as the total weighted output divided by the total weighted input. The findings of the study indicate that the mean value for DEA in public hospitals was 1.0478, 2.1426 for private hospitals and 0.7144 for faith based hospitals. This implied that private hospitals were more efficient than the other types of hospitals, followed by public hospitals and finally faith based hospitals. The findings are shown in Table 2.

Table 2: Descriptive Statistics on Performance of Hospitals

	N	Minimum	Maximum	Mean	Std. Deviation
Total inventory expenditure	216	1026000	1500000000	180952306.21	413310520.895
Total wage bill	216	741216	7100000000	672825692.54	1981981429.638
Income from outpatient	216	1665456	1300000000	149343461.21	356925556.777
Income from inpatients	216	1184040	10100000000	927698608.71	2827532036.076
Data Envelopment Analysis for Performance					
Public	63	.82	1.33	1.0478	.23002
Private	108	1.00	4.63	2.1426	1.52214
Faith Based hospital	45	.56	1.34	.7144	.34939

The study adopted DEA (Data Envelopment Analysis) model to measure efficiency and optimum performance of hospitals in Kenya in line with other scholars in the thematic area such as Caballer-Tarazona, Moya-Clemente, Vivas-Consuelo and Barrachina-Martinez (2010); Ozcan (2014); Chansky, Garner and Raichoudhary (2013) and Mayer (2013). The findings obtained in the study also concur with Pham (2011) who used data envelopment analysis method to calculate the relative efficiency of the hospitals and found that there was improvement in relative efficiency of hospitals that were attributed to technical aspects through encouragement of innovation in hospital operations thereby improving efficiency of hospitals.

Inferential Statistics

The study adopted correlation and regression analysis in form of Pearson correlation coefficient for correlation analysis and ANOVA and regression coefficients to determine the regression analysis. The study found that supply chain resilience and performance of hospitals had a Pearson coefficient of 0.669. The significant value was obtained as ($p = .000$) which was below 0.05 at 1 tailed test conducted in the study. This implies that there was a strong positive significant relationship between supply chain resilience and performance. The findings are in agreement with those of Eltantawy (2016) who postulated that resilience is a dynamic capability by which firms integrate, build and reconfigure internal and external competences to sustain firm performance. Additionally, the study is in line with Krishnan and Pertheban

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(2017) findings which that SC resilience is an important component of organizational performance. The findings are shown in table 3.

Table 3: Correlation Findings

		Performance
Supply Chain Resilience	Pearson Correlation	.669**
	Sig. (1-tailed)	.000
	N	216

**. Correlation is significant at the 0.01 level (1-tailed).

Prior to regression analysis, statistical tests were conducted in the study to determine the suitability of regression analysis. The study findings for supply chain resilience indicated a KMO value of 0.698 and Bartlett's test, $x2(21, N = 216) = 191.478$, $p = .000$. The test results indicated that supply chain resilience met KMO threshold of 0.6 and Bartlett's Test of Sphericity threshold of <0.05. The study therefore concluded that sampling was adequate for supply chain resilience variable. The findings are shown in Table 4.

Table 4: KMO and Bartlett's Test for Supply Chain Resilience

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.698
Bartlett's Test of Sphericity	Approx. Chi-Square	191.478
	Df	21
	Sig.	.000

The study further conducted the factor loading analysis to determine the number of variables that were retained. The study found that only the first factor had Eigenvalues of more than 1 representing 76.638% of the total variance explained while the remaining six factors had Eigenvalues of less than 1 and therefore found to be insignificant and were dropped. The findings are shown in Table 5.

Table 5: Total Variance Explained

	Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
		Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
Supply Chain Resilience	1	5.365	76.638	76.638	5.365	76.638	76.638
	2	.842	12.032	88.671			
	3	.417	5.953	94.623			
	4	.202	2.892	97.515			
	5	.126	1.805	99.319			
	6	.035	.494	99.814			
	7	.013	.186	100.000			

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The study further sought to determine the factor loadings for supply chain resilience. The findings obtained indicate that "The hospital uses different payment platforms" had the highest factor loading in the first component with 0.953 as shown in Table 6.

Table 6: Factor Loadings

	1
The hospital has adequate capacity to mitigate against demand and supply variations.	.832
The hospital has an efficient logistics system.	.921
The hospital has process back up plans and systems	.928
The hospital uses multiple sourcing of goods and services.	.928
The hospital encourages the use of local suppliers.	.643
The hospital uses different payment platforms	.953
The hospital has clear roles and responsibilities to minimize conflict	.883

Extraction Method: Principal Component Analysis.
a. 1 components extracted.

Linearity test was conducted by the study using the Durbin-Wartson test. If a significant deviation from linearity was greater than 0.05, then the relationship between the independent variable was confirmed to be linearly dependent and admissible. The study determined that a significant linear relationship between performance of hospitals and supply chain resilience existed as the deviation from linearity value was 0.056 which was more than 0.05 set by the study as shown in table 7.

Table 7: Linearity Test

			Sum of Squares	df	Mean Square	F	Sig.
Performance * Supply Chain Resilience	Between Groups	(Combined)	247.807	8	30.976	138143.319	.047
		Linearity	44.238	1	44.238	197289.118	.050
		Deviation from Linearity	203.569	7	29.081	129693.919	.056
	Within Groups		.046	207	.000		
	Total		247.854	215			

Prior to analyzing data using inferential statistical techniques, the study checked the normality of the data set by looking at skewness and kurtosis. The skewness values obtained in the study indicated that the scores were skewed as many were negatively skewed and not that much closer to zero. However, because all the skewness values fall within the range of -2 to +1, there was no case of excessive skewness in the data. The kurtosis values were also within the range of -2 to +1, and therefore did not display excessive kurtosis as well. These results suggested that the normality assumption was not strictly violated in the study. Normality test was done at 95% confidence interval for mean. The findings are shown in Table 8.

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Table 8: Normality Test Results

	N	Skewness		Kurtosis	
	Statistic	Statistic	Std. Error	Statistic	Std. Error
Supply Chain Resilience	216	-1.127	.166	.096	.330

Heteroscedasticity occurs when the variance in scores on one variable is somewhat different to all of the values of the other. In statistics, heteroscedasticity describes a situation in which the error term in the relationship between the independent variables and the dependent variable, is different across all values of the independent variables. The research used Glejser Test to test for heteroscedasticity. A significant value of 0.05 was used meaning that values greater than the significant value implied lack of heteroscedasticity issues in the study. The obtained values of significance for Supply Chain Resilience variables was 0.653. This indicates that there are no heteroscedasticity problems as the variable has a score of higher than 0.05. The findings are shown in Table 9.

Table 9: Heteroscedasticity Test Results

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	1.221	.082		14.936	.000
Supply Chain Resilience	-.094	.022	-.351	-.267	.653

a. Dependent Variable: AbsUt

Regression Analysis

The study conducted regression analysis to determine the influence of supply chain resilience on the performance of hospitals in Kenya. To achieve this, the study conducted the coefficient of determination to help predict the variability of performance in relation to supply chain resilience. Further, ANOVA test was done to determine the significance of the model. The coefficients of regression were also used to test the hypothesis of the study. The findings obtained are presented in Table 10.

Table 10: Regression Analysis for Supply Chain Resilience

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.669[a]	.448	.445	.67201	.448	173.717	1	214	.000

a. Predictors: (Constant), Supply Chain Resilience

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	78.450	1	78.450	173.717	.000[b]
	Residual	96.642	214	.452		
	Total	175.093	215			

a. Dependent Variable: Performance
b. Predictors: (Constant), Supply Chain Resilience

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Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.523	.189		2.772	.006
	Supply Chain Resilience	.665	.050	.669	13.180	.000

a. Dependent Variable: Performance

The study realized an R^2 value for the relationship between supply chain resilience and hospital performance of 0.448. This implies that 44.8% of the variation in performance could be attributed to changes in supply chain resilience of hospitals in Kenya. Therefore, other factors not studied in the present study contribute to 55.2% of the variation in performance of hospitals. The ANOVA test was also conducted to determine the reliability of the regression model. The significant value obtained was 0.000 which is less than 0.05 at 95% confidence level. The F value was 173.717 which is significant as shown by the significant value. This implies that the model was reliable in predicting the relationship between supply chain resilience and hospital performance. Hypothesis was also tested using the regression coefficients. Therefore, the following alternative hypothesis was tested;

H_a: There is a significant and positive influence between supply chain resilience and performance of hospitals.

According to the findings shown in Table 10, supply chain resilience had coefficients (β = .669, t = 13.180, p = .000). The significant value obtained was less than 0.05 set by the study, similar to the t value which was more than 1.96 at 5% significant level. The results therefore imply that there was a positive significant relationship between supply chain resilience and performance of hospitals in Kenya. Based on the findings, the study rejected the null hypothesis and therefore confirmed that supply chain resilience had a positive significant influence on performance of hospitals.

The findings of the study support the findings of Rodrigues, Vivan and Storopoli (2016) who found that institutional attractiveness and performance can be build through resilience by internally aligning resources, capacities and processes. Similarly, Aigbogun, Ghazali and Razali (2014) found that supply chain resilience constructs of flexibility, visibility, adaptability, collaboration, reserve capacity and supplier dispersity improved performance. Based on the ordinary least square model; $Y = \beta_0 + \beta_1 X_1 + \varepsilon$ for the ordinary least square model, ordinary least model therefore will be; $Y = 0.523 + 0.665X_1 + 0.189$. This implies that a unit increase in supply chain resilience will lead to 66.5% increase in hospital performance in Kenya.

CONCLUSION

The study found a strong positive relationship between supply chain resilience and performance of hospitals in Kenya. The study also concluded that most hospitals had spare capacity to mitigate against demand and supply variances, had clear roles and responsibilities to minimize conflicts, encouraged multiple sourcing of goods and services as well as used

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multiple payment platforms. The study further concluded that only a few of the hospitals encouraged the use of local suppliers as way of mitigating against supply risks.

Recommendations

The study recommended the use of outsourcing, spare capacity, and use of local suppliers to mitigate against healthcare operational risks. The study also recommended investment in long term relationship with service providers and involving them in decision making. In addition, the study recommended that employees should be involved in decision making; however ensure that their roles and responsibilities are clearly spelt out to avoid disputes.

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