



# The Moderating Role of Procurement Governance on the relationship between Supply Chain Agility and Service Delivery of the Public Health Care Sector in the County Governments of Western Region, Kenya.

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## Abstract

Supply Chain Management is a crucial activity that entails overseeing the movement of materials from the source, throughput, to the end consumer. However, in this endeavour, there are increased instances of uncertainties i.e. speeds of delivery, flexibility and environmental factors that affect the services rendered to the end consumer. This drives the concept of supply chain agility which focuses on the speeds of response to any changes in the consumer demands. The healthcare sector has undergone significant changes within the past decades. Amidst these changes, attaining efficient and effective healthcare service delivery remains a distant prospect among multiple nations. This study therefore sought to find out the moderating role of procurement governance on the relationship between supply chain agility and service delivery in the Public health care sector in the county governments of the western region. The hypothesis for the study was: - Procurement Governance has no significant influence on the relationship between Supply Chain Agility and Service Delivery of the Public Health care sector in the County Governments of Western Region. The study was anchored on three theories, theory of Human Service Delivery, Dynamic Capability Perspectives and Institutional Theory. The study adopted a Positivist research philosophy and a descriptive survey research design and the target population was 284 respondents of the four level 5 county hospitals in the western region. Questionnaires and interview schedules were used for data collection and analyzed using descriptive and inferential statistics. Data was presented using tables, scree plots and scatter plots. The study is of value to researchers and academicians, County government authorities and residents of the four counties. 258 respondents participated in the study and preliminary data checking, screening and cleaning was done. Validity and reliability statistics were done and they indicated that the research instruments were adequate for their purpose. Diagnostic tests were also conducted and none of the variables violated these assumptions. Regression analysis was done for the Supply Chain Agility and service delivery. Supply chain agility accounted for 44.5% of the changes in Service Delivery, but with the introduction of procurement governance as a moderator, the  $R^2$  value rose to 59.4% with p value less than 0.05. This indicated that Procurement Governance was a significant moderator of the relationship. The study recommended that hospitals should pay attention to three main aspects of procurement governance. First, they should set rules and policies that describe the authoritative position regarding the standards, principles, and objectives of the procurement process. Such standards include transparency and Accountability.

*Keywords:* Procurement Governance, Supply Chain Agility, Service Delivery

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## 1. Introduction

Supply Chain Management is a crucial sector that facilitates smooth industry operations. Essentially, Supply Chain Management entails the processes involved in the transformation of raw materials into finished goods that are of value to the customer. Initially, it was regarded as a mere clerical function within the broader organization. However, the function holds strategic importance as the business environment features an increasing number of competitors, locally and internationally, forcing organizations to design ways of improving their internal processes to remain ahead of their competitors. Today, the supply chain function's relevance is not only restricted to industries and manufacturers of goods but also service sector that also relies more on their supply chains as a source of competitiveness.

The health-care sector is one such industry whereby researchers and professionals have begun to pay attention to the supply chain as a strategic area for cost efficiencies and quality improvements (Kwon et al., 2016). The healthcare sector has undergone significant changes within the past decade. Most recently, the COVID19 pandemic has accelerated healthcare industry change causing increased shortages and lowered speeds of delivery of medical supplies and equipments as organizations and governments struggle to curb the spread of the virus (World Health Organization, 2017). In Busia and Bungoma counties, lack of resources to train the hospital management committees on effective supply chain strategies and shortage of drugs, staffs and limited bed capacities respectively are some of the reported challenges (Okedi & Adungo, 2021; Matheshe & Inimah, 2015).

Masaba, Moturi, Taiswa & Mmusi-Phetoe (2020) are in agreement with these studies citing lack of sufficient human, physical and financial resources in the countries health care sector hampering effective supply chain agility. The pandemic has placed new pressures on healthcare delivery systems, most of them attributed to supply chain disruptions, inadequate healthcare staff, infrastructure and other related global inequities (Deloitte, 2021). Supply chain agility remains at the backbone of healthcare service delivery since the quality of healthcare is significantly reliant on the availability and accessibility of medical supplies and equipment.

The healthcare supply chain entails manufacturing of health resources such as equipment and drugs and distributing them to healthcare providers and patients in a timely manner. The availability of medical equipments and drugs is correlated with effective healthcare service delivery (Zamzam et al., 2021). In general, healthcare organizations face unavailability of medical equipment due to delays in delivery, supply chain risks, unaffordability due to financial constraints, poor information systems and lack of responsiveness. Besides availability, adequate equipment and drugs also enhances timely and cost effective healthcare service delivery (Ogundele & Olafimihan, 2009).

There appears to be a lack of consensus about the effect of supply chain agility on firm performance. Globally, a study by Roius (2010) was conducted in French companies to investigate how supply chain agility would influence performance. Supply chain agility was operationalized as customer orientation, information systems and human resources flexibility while performance was operationalized as long-term customer relationships. The study by Roius (2010) reported that supply chain agility had a negative relationship with the establishment of long-term relationships with customers within customer contact centers.

Supply chain agility has become an issue of concern in the health care sector nationally. According to the Kenya National Commission for Human Rights (2017), agile supply chains in hospitals provide for responsiveness and resilience in supply of medical equipments. County governments have a right to ensure that their population has the right to fast, efficient and affordable health care. However, in pursuit of this agenda, there have been concerns of poor service delivery among county hospitals as occasioned by the lack of medical supplies and also shortage of the human resources (KNCHR, 2017). The Global Fund (2021) reports that 28% of orders in the public hospitals face delays of more than 30 days hence creating poor service delivery in the public health care sector.

Despite significant effort from the county governments to improve the state of public health in Kenya, the country's health sector is still marred with key challenges such as lack of sufficient human, physical and financial resources that hamper effective supply chain agility (Masaba et al., 2020). The devolution of the health sector in Kenya has brought unique challenges. One of the common challenges within the hospitals is delayed deliveries of medical equipments that inhibit effective service delivery amongst the population (The Global Fund, 2021). A social audit conducted by Transparency International (2020) reports that Vihiga county hospital is faced with inadequate funds thereby creating instances of low medical supplies and negating the quality of infrastructure and services at the facility.

A similar trend is notable in Busia county hospital whereby the hospitals lack adequate resources to induct and train their Hospital Management Committees on effective supply chain strategies that would enhance service delivery (Okedi & Adungo, 2021). In Busia County, corruption in the outpatient and inpatient departments occurs through unnecessary referrals to private practices, the request for informal payments from patients, extortion and absenteeism of service providers (Oduor, 2013). A study in Bungoma County hospital reports challenges such as shortage of staff, drugs and limited bed capacity (Matheshe & Inimah, 2015).

Studies have been done on the individual facets of supply chain agility and namely; Supply Chain Information System, Supply chain Resilience and Supply chain Responsiveness and service delivery of organizations in the United States of America, France, Nigeria, South Africa, Pakistan etc. The findings of these studies cannot be generalized to the Kenyan context owing to the different governance systems and different external environment forces.

Additionally, the studies did not find out the moderating effect of organizational policies on the relationship between supply chain agility and service delivery in county hospitals in Western Kenya. This study therefore sought to fill this gap by examining the effect of Supply Chain Agility on Service Delivery of the Public Health care sector in the County Governments of Western Region, Kenya and the Moderating role of Procurement Governance on the Relationship between Supply Chain Agility and Service Delivery of the Public Health care sector in the County Governments of Western Region, Kenya.

## 2. Literature Review

### Theoretical Literature Review

#### Dynamics Capability Perspectives

The dynamic capability perspective was developed by David Teece in 1997 through a special issue publication. He described the dynamic capability perspective as firm's ability to scan and develop its internal and external capabilities and use them to adapt to the changes within their environments. The theory is an extension of the resource-based view which attributes the differences in firm performance to the different kind of resources and capabilities that each of them own based on the argument that resources do not sufficiently explain the changes within an organization's environment (Binti & Ismail, 2019). Additionally, the dynamics capability perspective criticizes the resource-based view by highlighting that an organization's capabilities are not static, instead, they continue to evolve (Pisano, 2017). Dynamic capability is therefore, deemed as a tool of attaining competitive advantage through constantly changing and adapting to changes within the environment.

The dynamics capability perspective is a useful stand point that can be used to explain supply chain responsiveness and resilience. Responsiveness is the ability to proactively adapt to changes within the market, such as changes in customer preferences and demand to enhance or maintain competitive advantage while resilience takes a reactive approach allowing organizations to bounce back following disruptions in the external environment (Mandal et al., 2010). Therefore, supply chain responsiveness and resilience can be deemed as dynamic capabilities that organizations can rely on to develop or maintain their competitive advantage in today's rapidly changing environments.

#### Institutional Theory

The institutional theory was first developed by Talcott Parsons in 1956. In his article that was featured in *Administrative Science Quarterly*, Parsons emphasized the importance of paying attention to the organizational levels of society such as institutional, managerial and technical so as to understand the functioning of the broader society. Institutional theory argues that the institutions have a significant influence on an organization's formal structures. Essentially, even more than market pressures, institutional aspects such as routines, norms, rules and structures within an organization eventually become a significant determinant of social behavior. The institutional theory has been further developed by contemporary theorists. For instance, Meyer & Rowan (1977) hypothesize that the structures within institutions, such as rules and norms are used as tools of gaining legitimacy, thus enhancing organizational survival. Di Maggio & Powell (1983) highlight on three forces that help organizations attain institutional isomorphism. These include imitative, coercive and normative pressures.

The institutional theory can be used to inform understanding of governance as one of the moderating variables of study. There are several institutional pressures that are relevant to performance in the supply chain context. Normative pressures result from professionalization which can be brought about by formal education, industry and professional standards. Lastly, coercive pressures result from the pressures from the government, other regulatory authorities and customers. Leadership and legislation falls under the third category- coercive pressures. Formal coercive pressures such as regulations and laws have a significant effect on the choices that supply chains professionals make regarding social, economic and environmental sustainability (Sayed, Hendry & Zorzini, 2017).

#### Theory of Human Service Delivery

The theory of human service delivery was first postulated by Peter Senge in 1990. It theorizes that human beings are a resource within systems for service delivery. In a study that was conducted in the insurance context, Senge (1978) argued that it was difficult to develop metrics that could be used to measure intangible aspects of the industry such as the quality and delivery of services. In later years, more scholars began to apply the model to other service based industries. Theorists began to work to develop a system that can be used to build a system that ensures optimized service delivery for customers. The theorists suggested that every organization should develop their internal metrics that they use to measure quality of human services (Oliva 1996). They should also be able to have aspirational guidelines that direct the human resources within the organization on how to meet their shared vision and goals.

Health sector is primarily a service-centered industry. Even though hospitals also provide goods such as medicine and equipment, their core business is made up of people; medical professionals who work within the healthcare systems to deliver services to patients. This research focuses on the public health sector, whereby the key indicator for measuring performance is service delivery. The theory of human service delivery can be used to inform this research by shedding light on the challenges that hospitals face in measuring the quality of their services and suggesting indicators that they can use to objectively draw conclusions about the quality of their service delivery.

## **Empirical Literature Review**

### **Procurement Governance, Supply Chain Agility and Service Delivery**

A study by Krishnan & Teo (2012) investigated the relationship between informational structures and adoption of e-government across various countries with governance as a moderating variable. Governance in the study was operationalized using factors such as the level of control over corruption levels, effectiveness of government operations, quality of regulations and accountability. The study used a sample population of 178 countries and reported that governance had a significant moderating effect on the relationship between the existence of informational structures and adoption of e-government practices.

Munawar, Yanti & Supratikta (2020) conducted a study in banking sector to investigate the moderating role of internal controls on the relationship between the integration of the supply chain and performance in Indonesia. The study relied on a sample population of 450 middle managers and the study findings revealed that internal governance controls had a significant moderating effect on the relationship between the internal integration of a firm's supply chain and its performance. However, internal governance controls did not significantly mediate the relationship between the customer integration levels and the performance of banks in Indonesia.

A more recent study was conducted by Ngatno et al., (2021) in the African context. The researchers used governance as a moderating variable to investigate whether it had an influence on the relationship between capital structures and performance of accounting departments in rural banks in South Africa. The study relied on a sample population of 506 banks and the findings revealed that while some aspects of corporate governance such as the size had a significant influence on the relationship between capital structures and the performance of banks in South Africa, others such as the concentration of owners.

Andoh-Owusu (2021) sought to investigate the moderating effect of governance on the relationship between the internal audit practices and the performance of banks in Ghana. In the study, governance is operationalized using government policies and the type of corporate governance structures. The sample population consisted of 5 banks whereby 154 respondents were selected. The study findings revealed a significant negative effect between the variables when the governance variables were introduced. The study recommended that banks in Ghana should ensure that their governance structures are effective since they have an influence on the relationship between internal audit practices and firm performance.

Few studies in Kenya have been conducted in Kenya using procurement governance as a moderating variable. Mutuma et al., (2017) sought to investigate the significance of governance policies as a moderating variable that influences the link between the autonomy of workers and service delivery. It was based in the context of national government employees and used 228 respondents who are the managers who engage in policy making. The study findings revealed that government policies did not have a significant moderating effect on the relationship between the autonomy of workers and service delivery of national government institutions.

A study by Mutangili, Awuor & Cheluget (2020) uses regulatory frameworks- an aspect of procurement governance as a moderating variable with potential effect on the relationship between international purchasing practices and the performance of the supply chain. The study focused on the context of the energy sector using top and middle managers from 6 energy development agencies operating in Kenya. The correlation analysis revealed a significant influence of regulatory frameworks on the relationship between international purchase activities and the performance of supply chains in the energy sector.

One study by Otieno (2019) focuses on procurement governance as an independent variable with potential effect on service delivery at the county level. Procurement governance is conceptualized to consist of the procurement planning process, the policies and procedures involved in procurement, the standard templates for procurement processes and performance management of procurement. The study population consisted of 120 employees who have been employed in various departments at the institution. Using inferential statistics, the study tests whether procurement governance impacts service delivery and reports that there is a significant relationship between the two variables.

### 3. Materials and Methods

#### 3.1. Materials

The study adopted the positivism research philosophy and descriptive survey research design. The study was carried out in the Western region of Kenya. The study focused on county referral hospitals within the four counties. The target population for this study was employees with clinical roles within the four level five county hospitals - Vihiga County Referral Hospital, Busia County Referral Hospital, Kakamega County Referral Hospital and the Bungoma County Referral Hospital. For each of the strata of the study, the researchers used simple random sampling to select 284 respondents from a target population of 984.

#### 3.2. Methods

The main source of primary data for this research was questionnaires and interview schedule developed by the researcher. The study measured the validity of the research instrument for its content and construct validity. The study used factor analysis to test for construct validity which demonstrated if the items selected adequately reflected the constructs /phenomena of the study.

##### 3.2.1. Formula / Equation

The study relied on the formula proposed by Yamane (1973) for calculating sample size since it provided an easy formula for calculating sample size. The formula is depicted as below:

$$n = \frac{N}{1 + 0.05^2 (N)}$$

Where :

n= is the required sample size

N = number of people in the target population

e = allowable error term

When the values were substituted in the formula, the sample population was selected as below:

$$n = \frac{984}{1+0.05^2(984)} = 284$$

Cronbach Alpha was used to test reliability of the research instrument and all the coefficients of the variables were above 0.7 meaning they were good. The data was then coded and analyzed and the results presented in the form of charts, graphs and tables and done per the objective of the study. The study conducted a simple regression analysis and the model is as below:

$$Y = \alpha + \beta X_1 + \beta X_2 + \beta X_3 + M + \beta x_1 * M + \beta x_2 * M + \beta x_3 * M + \varepsilon$$

Where:

Y = Health Service delivery

$\alpha$  = constant

$\beta$  = Slopes of regression for the independent variables

X= Supply Chain Agility

M= Moderator

$X_{1,2,3} * M$  = Interaction Term

Before regression was carried out, the assumptions of regression were tested.

##### 3.2.2. Tables

The solution translated to 284 respondents. Therefore, the sample population was as Table 1:

**Table 1: Sample Size**

Strata	Bungoma	Vihiga	Kakamega	Busia	Total
Doctors	11	12	15	9	47
Clinical Officers	11	10	10	9	40
Nurses	54	28	78	37	197
<b>Total</b>	<b>76</b>	<b>50</b>	<b>103</b>	<b>55</b>	<b>284</b>

### 4. Results and Discussion

#### Response rate

Response rate in research is used interchangeably with return or complete rate, which refers to the number of responses that researchers receive upon issuance of a research instrument. It is expressed as a percentage and is calculated by taking the number of people who were responsive to a survey or interview divided by the total sample population and multiplying it by 100 (Baruch, Y., & Holtom, 2008). While it is desirable to have a 100% response rate, it remains challenging to attain maximum response rates unless the instrument was issued coercively to the respondents. Higher response rates in research increase the credibility of the findings to stakeholders (Deutskens et al., 2004).

The study had a sample population of 284 spread across 4 health facilities in Western Kenya: Kakamega County Referral Hospital, Vihiga County Referral Hospital, Busia County Referral Hospital and Bungoma County Referral Hospital. Response rate was calculated to ascertain whether the number of questionnaires that were completed and returned were adequately representative of the target sample of the research, thus ensuring that the research instrument performed as was intended. Among the 284 questionnaires that were issued, 258 were returned while 26 were not returned. This rate of return represented a 90.8% response rate.

According to Fincham (2008), response rates of 50% and above are deemed as acceptable, while those of above 75% are very good. Saldivar (2012) highlights that response rates between 40 and 50% are okay, 50-70% adequate and 70% and above very good. This study attained a 90.8% response rate which can be deemed as very good. The high response rate was attributed to the data collection procedures. The response rate is illustrated in Table 2 below:

**Table 2: Response Rate**

		Frequency	Percent
Valid	Returned	258	90.8
	Not Returned	26	9.2
	Total	284	100.0

### Demographic Characteristics of Respondents

This section focuses on analyzing the demographic characteristics of the respondents in the study. These include the name of the health facility, duration in the organization and position they hold within the facilities. The main aim of this analysis was to discover trends in the profiles of the respondents.

**Table 3: Demographic Characteristics of Respondents**

		Frequency	Percentage
Name of Health Facility	Kakamega County Referral Hospital	93	36.0
	Vihiga County Referral Hospital	45	17.4
	Busia County Referral Hospital	50	19.4
	Bungoma County Referral Hospital	70	27.1
Position held in the Facility	Medical Officer	40	15.5
	Clinical Officer	32	24.0
	Nurses	186	60.5
Length of Service in the Hospital	Less than 5 years	130	50.4
	5-10 Years	68	26.4
	More than 10 years	60	23.3

**Source:** Field Data (2023)

From the findings above, the study sought to establish the number of respondents from each of the facilities. Majority of the respondents 93 (36.0%) were from Kakamega County Referral Hospital, 70 (27.1%) were from Bungoma County Referral Hospital, 50 (19.4%) were from Busia County Referral Hospital and the least 45 (17.4%) were from Vihiga County Referral Hospital. The implication of these results is that the health facility in Western Kenya with the highest number of employees in the health sector is Kakamega County Referral Hospital. This could be attributable to the total size and population of each of the counties that the facilities represent. Kakamega County is the largest in size and population, followed by Bungoma, Busia and finally, Vihiga.

The study also investigated the positions that the respondents occupy in the health facilities. Majority of the respondents 186 (60.5%) were nurses, followed by clinical officers who were 62 (24.0%) and the least were medical officers who were 40 (15.5%). These findings imply that the health facilities employ more nurses, rather than clinical and medical officers. The need to employ more nurses as compared to clinical and medical officers can be attributed to the role that they play within healthcare facilities. They are expected to spend more time with patients

administering treatment interventions recommended by clinical and medical officers as well as conducting follow ups to ensure that patients attain optimal recovery outcomes.

The table also depicts the length of service for each of the respondents in the hospital facilities. Majority of the respondents 130 (50.4%) have spent less than 5 years, followed by 68 (26.4%) who had worked in the health facilities between 5 and 10 years. The least demographic was that of employees who have worked within the facilities for more than 10 years who were 60 (23.3%) of the total population of respondents. These respondents, therefore, understand the supply chain practices of their organizations as well as service delivery outcomes. They can thus, provide useful and credible information for this study regarding the five variables: supply chain resilience, supply chain responsiveness, supply chain information systems, procurement governance and service delivery.

### Multiple Regression Analysis - Supply Chain Agility and Service Delivery

The study carried out a multiple regression by regressing the dependent variable service delivery on multiple independent variables (supply chain resilience, supply chain responsiveness and supply chain information systems). The regression results are displayed in Table 4.39 below. The model was found to be a good fit with adjusted R<sup>2</sup> value of 0.445 or 44.5%. These findings imply that the combined effect of the supply chain agility practices explain 44.5 percent of the variation in service delivery among the health facilities of Western Kenya.

### Supply Chain Agility and Service Delivery

Table 4 explain model summary.

**Table 4:** 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	.667 <sup>a</sup>	.445	.438	.66309	.445	67.754	3	254	.000

a. Predictors: (Constant), InforSys, Resilience, Res

**Source:** Field Data (2023)

The table above demonstrates the amount of change that is observed on the dependent variable (service delivery) as predicted by the independent variables (supply chain resilience, supply chain responsiveness and supply chain information systems). The multiple regression produced an R value of 0.667 and the R<sup>2</sup> of 0.445, which implies that 44.5 per cent of the observed changes in service delivery can be explained by supply chain agility practices. Additionally, the adjusted R square (.438) strives to provide a more honest value estimating the R squared value for the entire population of the study at 43.8%.

**Table 5:** ANOVA Statistics for Supply Chain Agility and Service Delivery ANOVA<sup>a</sup>

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	89.371	3	29.790	67.754	.000 <sup>b</sup>
	Residual	111.679	254	.440		
	Total	201.051	257			

a. Dependent Variable: SeDel

b. Predictors: (Constant), InforSys, Resilience, Res

**Source:** Field Data (2023)

The Table 5 above presents the multiple regression model summary (ANOVA). The results demonstrate that the model is valid and useful in explain service delivery of healthcare facilities in Western Kenya (P=0.000). These values are adequate to demonstrate that the model is a good fit in explaining the variations in the dependent variable (service delivery) as a result of the changes in the predictor variable (Supply chain agility).

**Table 6:** Coefficients for Multiple Regression

Model	Coefficients <sup>a</sup>		t	Sig.
	Unstandardized Coefficients	Standardized Coefficients		
	B	Std. Error	Beta	

1	(Constant)	<b>1.269</b>	<b>.194</b>		<b>6.550</b>	<b>.000</b>
	Resilience	<b>-.011</b>	<b>.058</b>	<b>-.012</b>	<b>-.194</b>	<b>.846</b>
	Res	<b>.866</b>	<b>.078</b>	<b>.827</b>	<b>11.130</b>	<b>.000</b>
	InforSys	<b>-.275</b>	<b>.084</b>	<b>-.233</b>	<b>-3.287</b>	<b>.001</b>

a. Dependent Variable: SeDel

Source: Field Data (2023)

In the Table 6, the coefficients for the supply chain agility practices are presented. The first column highlights the unstandardized coefficients (B) for the three independent variables supply chain resilience, supply chain responsiveness and supply chain information systems as -0.011, 0.866 and -0.275, respectively. Moreover, the p values for the coefficients indicate that due to the confounding effects of supply chain resilience, only supply chain responsiveness and supply chain information systems are significant in predicting service delivery among the health facilities in Western Kenya. A one unit increase in supply chain responsiveness increases serviced delivery by .866 units while a one unit increase in supply chain information systems would reduce service delivery by .275 units. Evidently, among the three variables, supply chain responsiveness is the most important practice required to ensure service delivery of health facilities in Western Kenya. The influence of supply chain resilience, is however, insignificant based on the data that was analyzed for this study. These findings agree with those that are reported by Richey et al., (2022) which report that supply chain responsiveness has a statistically significant influence on service delivery in the public sector. Supply chain responsiveness is multifaceted in nature. It could focus on stakeholders, customers, suppliers, or the environment. However, responsiveness is more successful if all the four dimensions are aligned (Richey et al., 2022).

The generic multiple regression equation model given was as shown:

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \varepsilon$$

Hereafter letting SD be service delivery, SCRL be supply chain resilience, SCRIV be Supply Chain Responsiveness, and SCIS is supply chain information systems, using the regression coefficients in Table 4.41, the study has the model below.

$$SD=1.269 - 0.011SCRL+ 0.866SCRIV-0.275SCIS$$

Cohen et al., (1983) explain that it is important that the t-values of each of the independent variables is either greater than +1.96 or less than -1.96. Larger t-values and p-values that are smaller imply that the predictor variables contribute adequately to the dependent variable, thereby supporting the sufficiency of the model as a good fit. However, Supply Chain Responsiveness and Supply Chain Information Systems are found to have more significant power in predicting since they both have smaller p values, that are less than 0.05 (supply chain responsiveness p value= 0.000, supply chain information system, p value = 0.001). These results demonstrate that if the healthcare facilities increase their supply chain agility practices, there would be a subsequent increase in service delivery by the Beta values of each of the predictor variables. The study, therefore, attains its objectives and rejects the null hypothesis which states that supply chain agility practices have no significant influence on service delivery of health care facilities in Western Kenya.

### Testing for the Moderating Relationship

Hierarchical regression and stepwise regression will be used to test the moderating effect of procurement governance on the relationship between supply chain agility and service delivery. This step is crucial because there is a need to control procurement governance and its effect on service delivery.

### Hierarchical Regression for Moderation

The hierarchical regression for moderation occurred in three main steps which entailed coming up with three models. The first model entailed adding up all the independent variables of the study. According to Richardson et al., (2015) and Senaviratna & Cooray (2019), hierarchical regression should be conducted when there is a reduced potential for multicollinearity, and this was ensured by having the means of the independent variables centered and ensuring that the Variance Inflation Factor was less than 10. The second step of the hierarchical regression entails coming up with model 2 through adding the mean centered scores of the moderating variable (procurement governance). The model summary is depicted in the table below. Lastly, the third step entailed obtaining model 3 which combined all the interaction terms; the mean centered scores of the predictor as well as moderating variables to create a hierarchical regression model summary that is displayed in the table below:



**Table 7: Hierarchical Regression Model Summary****Model Summary**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. Change
1	.667 <sup>a</sup>	.445	.438	.66309	.445	67.754	3	254	.000
2	.772 <sup>b</sup>	.596	.590	.56627	.152	95.276	1	253	.000
3	.788 <sup>c</sup>	.621	.611	.55173	.025	5.505	3	250	.001

a. Predictors: (Constant), InforSys, Resilience, Res

b. Predictors: (Constant), InforSys, Resilience, Res, ProcGovern

c. Predictors: (Constant), InforSys, Resilience, Res, ProcGovern, InformationSysGov, ResilienceGov, ResponsivenessGov

**Source:** Field Data (2023)

The first model has a practical significant r-squared value of 0.445. These findings indicated that supply chain agility could explain 44.5% variations in Service delivery. The results also indicated that supply chain agility practices had a strong, positive relationship with service delivery with an  $r = 0.667$ .

The findings from the table above, model 2 also demonstrated that when procurement governance was introduced to the model as a moderator, both the predictor variables (Supply chain resilience, supply chain responsiveness and supply chain information systems) and the moderating variable, procurement governance were jointly and significantly related to the outcome variable of service delivery with an  $r$  value of 0.772, and a  $p$  value that is less than 0.05. The change in the r-squared value from 0.445 in model 1 to 0.596 in model 2 (an increase of 0.151). These results demonstrate that model 2 can be used to explain the change in service delivery from 44.5% to 59.6% as attributed to procurement governance.

The last model, model 3 tested how procurement governance moderates the relationship between supply chain agility and service delivery of hospitals in Western Kenya. The model entailed entering all the interaction terms; the predictor variables (supply chain resilience, supply chain responsiveness and supply chain information systems) and the moderating variable – procurement governance. The R-squared value increased from 0.596 to 0.621. The results indicate that procurement governance has a positive statistically significant impact on the relationship between supply chain agility and service delivery with an  $R$ -value of 0.788,  $R$ -squared value of 0.621 and a  $p$  value that is less than 0.05. These findings demonstrate that when moderated with procurement governance, the influence of supply chain agility practices could explain 62.1% of the change in service delivery, with the model being statistically significant with a  $p$ -value less than 0.05.

The hierarchical regression analysis model reveals that the addition of supply chain agility practices on service delivery is enhanced by procurement governance as a moderating variable. Additionally, the results show that the influence is positive and strong with an  $R$ -value of 0.788 and a  $p$  value that is less than 0.05. The study results, therefore, conclude that procurement governance moderates the relationship between supply chain agility practices and service delivery.

**Table 8:** ANOVA Table for the Hierarchical regression (with Moderator)  
**ANOVA<sup>a</sup>**

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	<b>89.371</b>	<b>3</b>	<b>29.790</b>	<b>67.754</b>	<b>.000<sup>b</sup></b>
	Residual	<b>111.679</b>	<b>254</b>	<b>.440</b>		
	Total	<b>201.051</b>	<b>257</b>			
2	Regression	<b>119.923</b>	<b>4</b>	<b>29.981</b>	<b>93.496</b>	<b>.000<sup>c</sup></b>
	Residual	<b>81.128</b>	<b>253</b>	<b>.321</b>		
	Total	<b>201.051</b>	<b>257</b>			
3	Regression	<b>124.950</b>	<b>7</b>	<b>17.850</b>	<b>58.640</b>	<b>.000<sup>d</sup></b>
	Residual	<b>76.100</b>	<b>250</b>	<b>.304</b>		
	Total	<b>201.051</b>	<b>257</b>			

a. Dependent Variable: SeDel

b. Predictors: (Constant), InforSys, Resilience, Res

c. Predictors: (Constant), InforSys, Resilience, Res, ProcGovern

d. Predictors: (Constant), InforSys, Resilience, Res, ProcGovern, InformationSysGov, ResilienceGov, ResponsivenessGov

**Source:** Field Data (2023)

The findings presented in the table above, at 5% significance level, the ANOVA tests indicate that the independent variables (supply chain resilience, supply chain responsiveness and supply chain information systems) were an important predictor of service delivery as demonstrated by an F-value of 67.754, with a 0.000 significance value at a p value that is less than 0.05. Cohen (2013) explains that in ANOVA results, models that have major practical implications are those with an eta square that is closer to 1. The eta square for the model 1 is 0.445 (44.5%) which indicates that model 1 has a major practical implication.

The findings on table above at 5% significance level, the ANOVA tests indicate that the independent variables (supply chain resilience, supply chain responsiveness and supply chain information systems) together with the moderating variable procurement governance, were an important predictor of service delivery as demonstrated by an F-value of 93.496, with a 0.000 significance value at a p value that is less than 0.05. Cohen (2013) explains that in ANOVA results, models that have major practical implications are those with an eta square that is closer to 1. The eta square for the model 2 is 0.596 (59.6%) which indicates that model 2 has a major practical implication.

The findings presented in the table above, at 5% significance level, the ANOVA tests indicate that the composite, independent variables (supply chain resilience, supply chain responsiveness and supply chain information systems) composite moderating variable (procurement governance), together with the interaction terms (independent variables \* procurement governance) were an important predictor of service delivery as demonstrated by an F-value of 58.640, with a 0.000 significance value at a p value that is less than 0.05. Cohen (2013) explains that in ANOVA results, models that have major practical implications are those with an eta square that is closer to 1. The eta square for the model 3 is 0.621 (62.1%) which indicates that model 3 has a major practical implication.

Moreover, hierarchical regression analysis is useful in demonstrating whether the moderating variable (procurement governance) can explain a statistically significant amount of change in the outcome variable (service delivery), after considering all other variables (Cohen et al., 1983). The results of the unstandardized coefficients are depicted in table 4.44 below.

**Table 9:** Standardized and Unstandardized Coefficients for Hierarchical Regression Coefficients<sup>a</sup>

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	<b>1.269</b>	<b>.194</b>		<b>6.550</b>	<b>.000</b>
	Resilience	<b>-.011</b>	<b>.058</b>	<b>-.012</b>	<b>-.194</b>	<b>.846</b>
	Res	<b>.866</b>	<b>.078</b>	<b>.827</b>	<b>11.130</b>	<b>.000</b>
	InforSys	<b>-.275</b>	<b>.084</b>	<b>-.233</b>	<b>-3.287</b>	<b>.001</b>
2	(Constant)	<b>.633</b>	<b>.178</b>		<b>3.556</b>	<b>.000</b>
	Resilience	<b>-.149</b>	<b>.052</b>	<b>-.151</b>	<b>-2.876</b>	<b>.004</b>
	Res	<b>.462</b>	<b>.078</b>	<b>.441</b>	<b>5.899</b>	<b>.000</b>
	InforSys	<b>-.222</b>	<b>.072</b>	<b>-.188</b>	<b>-3.098</b>	<b>.002</b>
	ProcGovern	<b>.657</b>	<b>.067</b>	<b>.595</b>	<b>9.761</b>	<b>.000</b>
3	(Constant)	<b>1.131</b>	<b>.218</b>		<b>5.189</b>	<b>.000</b>
	Resilience	<b>.271</b>	<b>.313</b>	<b>.276</b>	<b>.865</b>	<b>.388</b>
	Res	<b>-.329</b>	<b>.351</b>	<b>-.314</b>	<b>-.936</b>	<b>.350</b>
	InforSys	<b>-.282</b>	<b>.289</b>	<b>-.239</b>	<b>-.978</b>	<b>.329</b>
	ProcGovern	<b>.662</b>	<b>.067</b>	<b>.601</b>	<b>9.836</b>	<b>.000</b>
	ResilienceGov	<b>-.139</b>	<b>.094</b>	<b>-.703</b>	<b>-1.476</b>	<b>.141</b>
	ResponsivenessGov	<b>.179</b>	<b>.097</b>	<b>.965</b>	<b>1.838</b>	<b>.067</b>
InformationSysGov	<b>.038</b>	<b>.081</b>	<b>.169</b>	<b>.466</b>	<b>.641</b>	

a. Dependent Variable: SeDel

Source: Field Data (2023)

Table 9 above represents the unstandardized and standardized coefficients for hierarchical regression analysis for model 1, 2 and 3. First, the table demonstrates the beta values for the mean centered independent variables for model 1. While supply chain responsiveness (( $P=0.000 < 0.05$ ) and supply chain information systems ( $P=0.001 < 0.05$ ) were significant predictors of service delivery, supply chain resilience ( $P=0.846 > 0.05$ ) was insignificant in predicting service delivery. Model 2 depicts the beta values for the mean centered independent variable of supply chain responsiveness and procurement governance were positive while the beta values for supply chain resilience and supply chain information systems were negative by -0.149 and -0.222 units, respectively. Supply chain responsiveness and procurement governance, however, had a positive contribution towards service delivery.

Model 3 in table 9 above shows that procurement governance ( $P=0.000 < 0.05$ ) was a significant predictor of service delivery. The interaction between procurement governance and each of the independent variables such as supply chain resilience ( $P=0.141 > 0.05$ ), supply chain responsiveness ( $P=0.067 > 0.05$ ), and supply chain information systems ( $P=0.641 > 0.05$ ), are not significant contributors to service delivery

Hence, the results from table 9 above lead to a hierarchical multiple regression model that can be displayed as below:

$$Y = 1.131 + 0.271X_1 - 0.329X_2 - 2.82X_3 + 0.662X_4 - 0.139X_1 * X_4 + 0.179X_2 * X_4 + 0.038X_3 * X_4 + e$$

## 5. Conclusion

The study used hierarchical and stepwise regression to assess the effect of the moderator effect on the relationship between supply chain agility and service delivery. The moderator variable had a significant effect on the relationship between the predictor and outcome variables. Model 1 was formulated without the moderator variable and attained an R-squared value of 0.445 (44.5%) while model 2 included the moderator variable and the R-squared value increased to 0.596 (59.6%). Therefore, the moderating variable is responsible for the change from 44.5% to 59.6% which accounts for 15.1% change in the outcome variable (service delivery).

Procurement governance has been established as a key enabler of service delivery. The study's respondents agreed that procurement governance can enhance their hospitals' ability to deliver services to their stakeholders. Procurement governance entails the systems and procedures that have been put in place to facilitate the procurement process ensuring appropriate probity and control levels (Shakya, 2012). Essentially, the framework of procurement governance specifies responsibilities, standards, practices, and communications for the public procurement process. Procurement is just recently growing to become a strategic, rather than a clerical function. The Kenyan government is also still reforming the sector to ensure that the public sector procurement operates within streamlined systems of governance. A conclusion that can be made from this study is that there exists a strong link between procurement governance and service delivery. The implementation of supply chain agility practices along with procurement governance shows a huge impact on service delivery. The application of both practices; supply chain agility and procurement governance, should be carefully considered. The findings of the study demonstrate that not all supply chain agility practices can enhance service delivery.

Procurement governance should also be given key consideration so as to improve service delivery in hospitals. This study has demonstrated that procurement governance accounts for 15.1% change in the attainment of service delivery, given the use of supply chain agility practices in the health sector. The hospitals should pay attention to three main aspects of procurement governance. First, they should set rules and policies that describe the authoritative position regarding the standards, principles, and objectives of the procurement process. Such standards include transparency and Accountability.

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