

Supply Chain Leagility and Performance of Humanitarian Aid Organizations in Kenya: An Effective, Efficient and Quick Way to Response to Disasters.

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Abstract

In today's volatile and uncertain humanitarian environment, adopting a purely lean or agile supply chain is not effective. Humanitarian organizations are struggling to obtain the highest possible performance from their supply chains by adopting various supply chain designs. This is upon realization that despite the huge chunks of money pumped into the sector, humanitarian supply chains respond in a sluggish, inefficient and poorly coordinated manner to emergencies. The purpose of this study was to explore the influence of supply chain responsiveness and waste management on performance of humanitarian aid organizations in Kenya. Survey research design was employed for this study. The study entailed a census survey of 330 humanitarian aid organizations carrying out their operations in Kenya. Questionnaires were used to collect primary data. Descriptive statistics and inferential statistics was used for data analysis. The data was presented using a combination of statistical and graphical techniques. The study findings revealed that supply chain responsiveness and waste management are positively associated with performance of humanitarian aid organizations. The findings of this study established that most humanitarian organizations had partially implemented supply chain leagility. The findings further showed the essence of the country to be prepared to reduce the effect of disasters. The culture of preparedness was lacking in the country despite increase in disaster resource allocation. The study recommended that in order to achieve a supply chain that is efficient and responsive to the needs of vulnerable people, humanitarian aid organizations should design, implement and fully adopt supply chain leagility. Humanitarian aid organizations were also recommended to embrace advanced technologies to improve their supply chain leagility.

Keywords: *Supply Chain Responsiveness, Waste Management, Supply Chain Leagility, Humanitarian Supply Chain*

1. Introduction

Supply chain management has come out as a common art with which organizations outflank each other competition wise. Organizations are making all efforts to obtain the highest possible performance from their supply chains by utilizing varied assorted means in the contemporary period (Chan, Ngai & Moon, 2017). Competitive edge can be achieved with no doubt when a company has adopted an effective supply chain strategy and design by utilizing its capabilities

on supply chain to realize flexibility, rapid response and efficient cost. Several studies have come up with various supply chain designs, which are mutually exclusive or even collectively exhaustive such as the efficient versus responsive (Manning & Soon, 2016); risk hedging, and agile (Chen & Kitsis, 2017) and market of one versus mass market. There is evidence of movement from independent supply chain patterns to hybrid models such as leagile supply chain as proposed by Nakandala & Lau (2019). This backs the argument that in the current inconsistent and wavering environment, relying entirely on a purely lean or a purely agile supply chain is not guaranteed to pay off.

Conversely, natural and manmade catastrophes have substantially increased in magnitude as well as frequency in recent years. According to the United Nations, natural calamities in the coming years will increase in severity, frequency as well as damaging effect. Humanitarian supply chains are responsible for provision of services in emergencies during disasters by availing food, shelter, medicine, water and sanitation (Montz, Tobin & Hagelman, 2017). When disaster containment is involved, time is an important factor as time saved means lives saved (Apte, Goncalves & Yoho, 2016). Since 80% of disaster and relief operations involve supply chains, proper chain management concepts offer possibilities to increase efficiency and effectiveness of humanitarian operations (Papadopoulos *et al.*, 2017).

Worldwide, supply chain experts are in persistent quest for new and inventive methods for building productive and successful supply chains designs that will adjust to quick changes in catastrophic situations. One such design commonly adopted by humanitarian supply chains, all-inclusive is the use of leagile principles in supply chains (Datta, 2017). The leagile supply chain is a hybrid of lean concept and agile paradigm to form a common supply chain design (Nayak & Choudhary, 2020). The development of lean concept is credited to Toyota Company and largely the Toyota Production Systems. Lean aims at doing more with less (Mostafa & Dumrak, 2017). The lean concept is essentially a combination of administrative operations with emphasis on eradication of waste in the production process inside and beyond organizations (Bortolotti *et al.*, 2016). Biazzo, Panizzolo and Crescenzo (2016) were of the view that basic principles of lean entails identifying, creating value as well as alleviating waste and generating flow. The agility paradigm, which evolved from flexible manufacturing systems, focuses on the integration of the organization's suppliers, business procedures, buyers and commodity consumption and disposition (Abdi, Labib, Edalat & Abdi, 2018). An agile supply chain due to its ability to dependably meet market demands, at the same time minimize expenditure, and lowering security risks better suits a changing and unpredictable business environment. This integrates flexibility as pertains to both resources and coordination of activities (Gligor *et al.*, 2019). Attainment of resource and coordination flexibility make it possible for organizations to address the increasing environmental and operational unpredictability (Teece, Peteraf & Leih, 2016). Thus, when talking of agility, the focus is on responding to unexpected changes in a volatile marketplace within a useful timeframe, denoting flexibility, speed, responsiveness and quality as elements of agility.

Though lean and agile principles have been used within supply chains for some time, in practice leanness does not imply agility. When markets are volatile or uncertain like in the humanitarian context, leanness should be blended with agility into a hybrid leagile strategy to create a more responsive supply chain that will deliver aid in an effective and efficient manner. Lean paradigm function optimally in a predictable demand, where accurate forecast can be made. Through elimination of all forms of waste, lean system have high competitive edge base on quality and cost. The agility is a much diverse concept, which needs participation of the whole organization, logistics processes and information systems (Christopher, 2016). The agile supply chain makes organization to respond effectively in situations where there is unstable customers demand and a highly volatile market. Lean and agile paradigms have attracted substantial interests currently

forcing industries globally to upgrade their systems to the paradigms for purposes of fostering their performance (Christopher, 2016). The contemporary market trends calls for a more practical proposition that assimilate the promising facets of both lean and agile structures. Through this inspiration, leagility paradigm has developed as features of the two paradigms have been combined for a robust strategy.

According to Namagembe (2020), humanitarian entities participate majorly in two forms of activities; relief and development activities. Despite the huge chunks of money pumped into humanitarian sector, stringent oversight by donors and expectations from vulnerable populations, humanitarian supply chains still respond in a sluggish, inefficient and poorly coordinated manner to emergencies (Paul, 2019). Mark you, about 80% of disaster and relief operations are related to supply chains (Maghsoudi, Zailani, Ramayah & Pazirandeh, 2018). The poor performance of humanitarian aid organizations is attributed to poor management of supply chain operations (Bealt *et al.*, 2016). Thus, the inference that humanitarian aid organizations are performing way below the expected levels. Sinha (2019) supports this by concluding that 50% of humanitarian aid organizations have non-performing supply chains. This study aimed at bringing efficiency and effectiveness into humanitarian sector by looking into the concept of supply chain leagility. Predominantly, the concept was discussed in the context of commercial supply chains (Fadaki, Rahman & Chan, 2019) and only a few number of academicians and practitioners have linked supply chain leagility to humanitarian operations (Kuria & Chirchir, 2014; Purvis *et al.*, 2016; Koori & Chirchir, 2017). Qamar and Hall (2018) found that the two paradigms of lean and agility could not co-exist (mutually exclusive) where else Purvis *et al.* (2016) described them as complementary concepts. The concept of supply chain leagility has been globally accepted (Galankashi & Helmi, 2016). A number of humanitarian aid organizations have adopted leagility design despite its poor documentation limiting its full adoption, to increase efficiency in their supply chains (Ponnusamy, 2019). Concisely, the employment of the leagility concept is still immature and a comprehensive overview of the concept barely exists. Previously the lean and agile paradigms have been studied separately creating the need to study them as a hybrid design and supportive of each other. This therefore creates a gap for a specific study that focuses exclusively on supply chain leagility.

Objectives of the Study

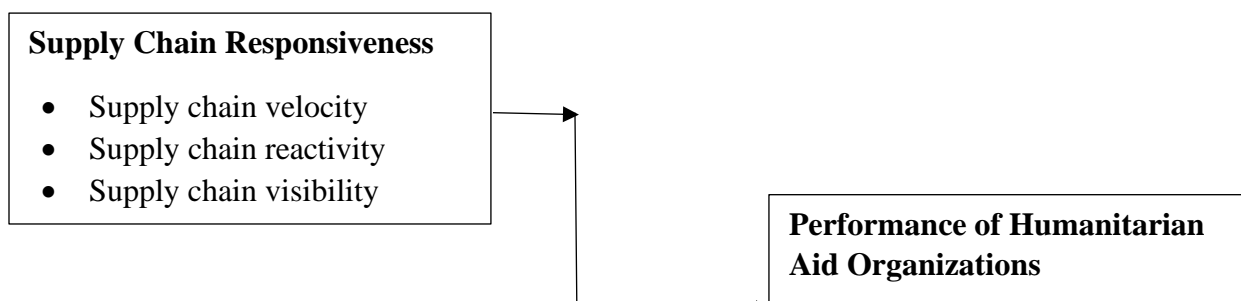
The general objective of this study was to determine the influence of supply chain leagility on performance of humanitarian aid organizations in Kenya. The specific objectives for this study were:

- i. To examine the influence of supply chain responsiveness on the performance of humanitarian aid organizations in Kenya.
- ii. To determine the influence of waste management on the performance of humanitarian aid organizations in Kenya.

Research Hypotheses

- i. **H₀:** Supply chain responsiveness does not significantly influence the performance of humanitarian aid organizations in Kenya.
- ii. **H₀:** Waste management does not significantly influence the performance of humanitarian aid organizations in Kenya.

Conceptual Framework



Independent Variables

Dependent Variable

Figure 1: Conceptual Framework

2. Methodology

A survey research design was employed for this study. This research design is appropriate where large population geographically spread is involved which was the case in this study. The design enabled the study to apply both qualitative and quantitative research approaches as observed by Rahi (2017) that the two approaches reinforces each other. The target population of this study was 330 humanitarian aid organizations carrying out their operations in Kenya as derived from the NGO Coordination Board of Kenya (2018). This study was a census examining the entire population (Mujere, 2016), supply chain managers in this case, that have a particular set of characteristics such as specific experience, knowledge, skills or exposure to an event. Questionnaires were used to obtain primary data for the study. The questionnaires contained structured and semi-structured questions that captured the various variables of the study. The questionnaires were hand delivered by research assistants to the respondents using drop and pick technique. Concerning the qualitative aspects of the study (open-ended questions), the authenticity of the findings was considered primal thus the researcher hoped that respondents would be truthful by avoiding giving distorted accounts of events surrounding supply chain leagility.

With the study being quantitative and qualitative in nature, both descriptive statistics and inferential statistics was employed. The study adopted inferential data analysis in order to enable it make suppositions that extend beyond the immediate data alone to infer from the sample data about the whole population (Trafimow, 2017). The study used SPSS version 24 to facilitate the analysis of data. Inferential data analysis was done using Pearson correlation coefficient and regression analysis. Data was also analyzed using descriptive statistics; measures of central tendency, measures of dispersion and measures of symmetry and inferential statistics. Linear regression analysis revealed the correlation and strength of the relationship between both independent and dependent variables. Analysis of Variance also sought to test the goodness of fit of the regression models and finally to test the hypothesis of the regression models. Data collected from open-ended questions was analyzed qualitatively through content analysis. The information was presented using a combination of statistical techniques and graphical techniques. The hypothesis was tested by running an Ordinary Least Square regression model for the combined sub-constructs of each independent variable against the combined measures

of the dependent variable. The acceptance/rejection criteria was that, if the P-value is greater than 0.05, the study fails to reject the H_0 but if P-value is less than 0.05, the H_0 is rejected.

3. Research Findings and Discussions

Descriptive analysis was used to describe the basic features of the data in the study providing a summary about the sample and the measure thus helping in simplifying massive amounts of data in a sensible and convenient style. It expressed the variables in frequencies, percentages, means and standard deviation. The study analyzed descriptive statistics for all the study variables.

Supply Chain Responsiveness

The study sought to examine the influence of supply chain responsiveness on performance of humanitarian aid organizations in Kenya. This objective was measured using the following indicators: supply chain velocity, supply chain reactivity and supply chain visibility in the opinion statements given. Respondents were asked to indicate the extent to which supply chain responsiveness influenced performance of humanitarian aid organizations in Kenya. This was based on a likert scale of not at all, small extent, moderate, large extent and very large extent. Therefore, in this study, a scale of not at all and small extent implied disagree while large and very large extent implied agreement. The results were expressed as percentages, mean and standard deviation as indicated in Table 1 below.

Table 1: Descriptive Analysis of Supply Chain Responsiveness

Statements on Supply Chain Responsiveness	1 %	2 %	3 %	4 %	5 %	Mean	Std Dev
Our supply chain evaluates, considers and covers needs quickly by providing basic essentials to alleviate suffering people.	0	0	24. 1	51. 7	24. 1	4.00	0.69 6
The supply chain has an element of visibility enabling the view of the movements along the supply chain, including identity, location and status of transit together with planned and actual dates and times for the events	0	0	20. 7	55. 2	24. 1	4.03	0.67 0
Leagility enables reliability of supply chains	0	0	20. 7	48. 3	31	4.10	0.71 3
The ability of humanitarian organizations to respond quickly to emergencies might be challenging due to issues of resources, funding and lack of information	0	0	3.4	51. 7	44. 8	4.41	0.55 9
A guarantee of the humanitarian supply chain to quickly deliver is a real selling point if that order arrives quickly, accurately and complete otherwise its termed as waste.	0	0	13. 8	51. 7	34. 5	4.21	0.66 4
Our organization has a close partnership with suppliers that enables delivery of requested supplies within the requested time and place especially when handling a disaster or an emergency	0	0	3.4	41. 4	55. 2	4.52	0.56 5
Our supply chain has high degree of flexibility in terms of assembling and transportation structure to meet the needs of suffering people	0	0	17. 2	44. 8	37. 9	4.21	0.71 5

Key: 1-Not at all; 2-Small Extent; 3-Moderate Extent, 4-Large Extent and 5- Very Large Extent

Majority of the respondents (75.8%) agreed that humanitarian supply chains evaluate, consider and covers needs quickly by providing basic essentials to alleviate suffering of vulnerable people while 24.1% indicated moderate extent. Large number of respondents (79.3%) agreed that their supply chain has an element of visibility enabling the view of the movements along the supply chain, including identity, location and status of transit together with planned and actual dates and times for the events as 20.7% moderately agreed. Elsewhere, 79.3% of the respondents agreed that leagility enables reliability of humanitarian supply chains while 20.7% moderately agreed that reliability is enabled by leagility design of the supply chains. The ability of humanitarian aid organizations to respond quickly to emergencies might be challenging due to issues of resources, funding and lack of information as indicated by 96.5% of the respondents who agreed and 3.4% of the moderate responses. Majority of the respondents (86.2%) agreed that, a guarantee of the humanitarian supply chains to quickly deliver is a real selling point if that order arrives quickly, accurately and complete otherwise it is termed as waste while 13.8% moderately agreed.

Respondents were asked to indicate whether humanitarian aid organizations had a close partnership with suppliers that enables delivery of requested supplies within the requested time and place especially when handling a disaster or an emergency, 96.6% and 3.4% agreed and moderately agreed respectively to the statement. Lastly, majority of the respondents (82.7%) agreed that supply chain has high degree of flexibility in terms of assembling and transportation structure to meet the needs of suffering people as 17.2% indicated moderate.

In general, the findings in Table 1 found out that humanitarian aid organizations in Kenya have supply chains that are designed to be responsive to the needs of vulnerable populations. The humanitarian supply chain are designed to evaluate, consider and cover needs quickly while enabling a view of the movements along the supply chain. Further to increase the element of supply chain velocity and reactivity, humanitarian aid organizations have established close relationships with suppliers in the effort to improve responsiveness. The humanitarian supply chains are also designed to be flexible to meet the needs of vulnerable people in aspects of transportation, assembling and dispatch. However, the ability of humanitarian aid organizations to respond quickly to emergencies and disasters is a challenging task influenced by the various challenges facing humanitarian supply chains such as lack of information, insufficient resources and poor funding. This means that despite the supply chains being designed to be responsive to emergencies, there is still an element of sluggishness in most humanitarian supply chains in Kenya resultant from the challenges faced. This shows lack of preparedness by humanitarian aid organizations in responding to emergencies and disasters. Preparedness entails all the activities undertaken before a disaster occurs that enhance the readiness of humanitarian organizations and the society to counter the emergency. Preparedness measures are crucial as they minimize the time spent in undertaking the immediate response and increase the odds of quick recovery. During the preparation phase, hazards/risks are acknowledged and strategies designated to address response and recovery necessities. The findings of this study concurred with Rodríguez-Espíndola, Chowdhury, Beltagui and Albores (2020) study that established the humanitarian supply chain management challenges as delayed delivery of the appropriate products, faulty information integration and uncertainty in demand among others.

Waste Management

The study sought to determine the influence of waste management on performance of humanitarian aid organizations in Kenya. This objective was measured using the following indicators: internal controls, value proposition and continuous improvement in the opinion statements given. Respondents were required to indicate the extent to which waste management

influenced performance of humanitarian aid organizations in Kenya. This was on a likert scale of not at all, small extent, moderate, large extent and very large extent. Therefore, in this study the scale of Not at all and small extent meant disagree while large and very large extent meant agreed. The results were expressed as percentages, mean and standard deviation as shown in Table 2 below.

Table 2: Descriptive Analysis of Waste Management

Statements on Waste Management	1 %	2 %	3 %	4 %	5 %	Mean	Std Dev
Leagility creates checks and balances that improves waste Management process.	0	0	34. 5	51. 7	13. 8	3.79	.664
Leagility enables systems use and improve waste management	0	3. 4	20. 7	37. 9	37. 9	4.10	.846
Through waste management practices, the organization have a better value proposition	0	3. 4	13. 8	31. 0	51. 7	4.31	.836
Waste management practices are continually improved	0	0	13. 8	51. 7	34. 5	4.21	.664
Our supply chain emphasizes on reduction of waste of resources by identifying non-value adding activities and eliminating them.	0	3. 4	13. 8	55. 2	27. 6	4.07	.741
Wastes in the supply chains may include overproduction, waiting, transport, unnecessary motion, inappropriate processing, unnecessary inventory and defects.	0	3. 4	20. 7	34. 5	41. 4	4.14	.861
Minimization of waste or loss of product enhances resource utilization	0	3. 4	27. 6	31	37. 9	4.03	.891
The organization has managed to eliminate non-value adding operations in the supply chain	3. 4	3. 4	17. 2	48. 3	27. 6	3.93	0.94 6

Key: 1-Not at all; 2-Small Extent; 3-Moderate Extent, 4-Large Extent and 5- Very Large Extent

Majority of the respondents (65.5%) agreed that leagility creates checks and balances that improves waste management process in supply chains as 34.5% moderately agreed that leagility design of supply chains provides for checks and balances. A large number (75.8 %) of respondents agreed that leagility enables systems use and improve waste management. 20.7% moderately agreed as 3.4% of the respondents disagreed that leagility enables systems use and improvement of waste management. Respondents agreed (82.7%) that through waste management practices humanitarian aid organizations have better value propositions. 3.4% of the respondents disagreed as 13.8% moderately alluded to the statement. The practice of waste management in humanitarian aid organizations is continuous improved as indicated by 86.2% and 13.8% of the respondents who agreed and moderately agreed respectively.

Majority of the respondents (82.8%) agreed that humanitarian supply chains emphasize on reduction of wastage of resources by identifying non-value adding activities and eliminating them. 13.8% moderate responded while 3.4% disagreed on the emphasize. Respondents were asked to respond on the various types of wastes in humanitarian supply chains and 75.9% of the respondents agreed that overproduction, waiting, transport, unnecessary motion, inappropriate processing, unnecessary inventory and defects are the common types of waste in supply chains as 20.7% moderately agreed and 3.4% disagreed with the assertion. A large number of

respondents (68.9%) also agreed that minimization of wastes enhances resource utilization. Lastly, most humanitarian aid organizations (75.9%) had managed to eliminate non-value adding operations in their supply chains as indicated in the findings as 17.2% moderately responded. Still 6.8% of the organizations were yet to eliminate non-value adding operations in their humanitarian supply chains.

Based on the study findings in Table 2, leagility is an essential design of waste management in humanitarian supply chains. Leagility design creates checks & balances and enables systems use improving waste management. Waste management is a continuous exercise in humanitarian aid organizations involving identification of non-value adding activities in the supply chains and eliminating them. Majority of the organizations had managed to eliminate the non-value adding operations in their supply chains but still some humanitarian aid organizations were yet to. Overproduction, waiting, transport, unnecessary motions, inappropriate processing, unnecessary inventories & defects, theft, misappropriation, poor tracking and control as well as product deterioration were identified as the common types of wastes in humanitarian supply chains. Minimization of such wastages enhances resource utilizations in the organizations. Most humanitarian supplies fall into the relief items category that face specific challenges related to in-kind donations ranging from storage and transportation bottlenecks that bring about inefficiency.

The findings of this study agree with Iyengar and Bharathi (2018) study of analysis of lean, agile, and leagile supply chains that waste management is an important aspect of leagility supply chain. To eliminate wastes from all the elements of the supply chain calls for continuous improvement processes. Hassani, Ceaușu and Iordache (2020) on the other hand in their study on lean and agile model implementation for managing the supply chain found that volatile and unpredictable environments demand supply chains that minimize waste and ensure flexibility, as was the case in the findings of this study.

Qualitative Analysis

Thematically, recurrent themes were drawn from qualitative responses received from the supply chain managers. As many potential themes as possible were manually coded for purposes of establishing patterns.

Supply Chain Responsiveness

Exploration of the views of supply chain managers on supply chain responsiveness was conducted using three items on research instrument. First, the various disasters that disrupt communities triggering the need for supply chain responsiveness. Secondly, the strategies humanitarian aid organizations adopt to make their supply chains more responsive. Lastly, respondents were asked to identify the driving forces making humanitarian aid organizations design their supply chains to be responsive to societal needs.

The study sought to determine the various disasters and situations triggering the need for supply chains to be responsive by disrupting communities at large in Kenya. The findings indicated that Kenya has been subjected to various disasters, which are classified on basis of origin and cause as either manmade (anthropogenic) or natural in nature. Commonly identified natural disasters included disease outbreaks, plagues/invasions, floods, landslides/mudslides, droughts and famine. Additionally, though utterly devastating but occurring less frequently in Kenya, other natural disasters (geographic in nature) include earthquakes and volcanic eruptions. Manmade disasters, commonly known as anthropogenic disasters because they occur from human activities, can be categorized into technological, sociological and transportation disasters. Common manmade disasters identified included structural/buildings collapse, chemical leaks,

spillovers, manmade fires, terrorist activities, human conflicts, traffic accidents and politically instigated violence.

Four themes commonly emerged from the participating supply chain managers concerning the strategies adopted in increasing supply chain responsiveness. Modularity emerged as a strategy to increase supply chain responsiveness in humanitarian aid organizations. Modularization in supply chain management refers to division of a greater whole to interchangeable parts that fit together seamlessly and together in many different combinations and permutations make many different wholes. (Micheli, Trucco, Sabri & Mancini, 2019). Other strategies commonly identified from the views of supply chain managers to increase responsiveness in humanitarian supply chains were shortened lead-times, Transport and capacity planning and the postponement strategy. The driving forces making humanitarian aid organizations to design responsive supply chains emerged as the need to rescue lives, pressure from donors and the increased number of disasters and emergencies in the contemporary period.

Waste Management

An examination of waste management practices in humanitarian aid organizations was conducted using open-ended questions to the supply chain managers. Two items were used seeking the various forms of wastes in humanitarian supply chains and the mechanisms humanitarian aid organizations employ to minimize wastes in their supply chains. There is a lot of wastage associated with humanitarian aid because the development of incessant supply chains has been ignored.

Forms of wastes in humanitarian supply chains emerging from the views of supply chain managers include corruption and diversion of funds. With the circumstances existing in most donor-funded humanitarian aid organizations, funds allocated for emergency response are prone to corruption as an external factor. Other ways of diversion of funds identified were sale of goods intended for relief and distribution of relief items to people to whom the aid is not intended in exchange for payment. Delaying the spending of emergency funds on the purpose they are meant for and investing them in the meantime. Those involved then pocket the earned profits. Certainly, the findings of this study support Bader (2020) findings that diversion of aid funds largely reduces the quantity, quality and appropriateness of assistance for the needy and instead serve the interests of hidden target groups to whom the aid was never meant. Concisely, disasters and pandemics provide a smokescreen for dubious transactions for personal benefit with no or little scrutiny. This explains the increase in money-minting schemes by disasterpreneurs.

Mechanisms of addressing supply chain wastage in relief operations identified included the eradication of import and tax fees. Furthermore, punishments were imposed for misuse of services, cancellations had to be done the soonest possible, and a binding clarification made. It was further declared that communication was to be made any time a service needed to be made. This is to avoid concentrating aid in some places while leaving others out. Checks and balances also emerged to be a control against theft and use of goods made for vulnerable people for private gains. Other internal control mechanisms include audits boosting effective resource utilizations.

Correlation of Study Variables

Table 3 illustrates the correlation matrix between the independent variables. Correlation is essentially a tool for determining how a collection of variables relate thereby facilitating the testing for multicollinearity. That the correlation values are not close to 1 or -1 is an indication

that the factors are sufficiently different measures of separate variables (Gogtay & Thatte, 2017). It also implies that the variables are not multicollinear. When there is no multicollinearity, the study is able to utilize all the independent variables.

Table 3: Results for Correlation of Study Variables

		Performance of HAOs	SCR	WM
Performance of HAOs	Pearson Correlation	1		
	Sig. (2-tailed)			
	N	290		
Supply Chain Responsiveness	Pearson Correlation	.765**	1	
	Sig. (2-tailed)	0.000		
	N	290	290	
Waste Management	Pearson Correlation	0.661**	0.31	1
	Sig. (2-tailed)	0.000	0.062	
	N	290	290	290

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

* . Correlation is significant at the 0.05 level (2-tailed).

Correlation coefficient ranges from -1.00 to +1.00. The value of -1.00 signifies a perfect negative correlation whereas a value of +1.00 represents a perfect positive correlation. A value of 0.00 implies the absence of any relationship among variables being tested (Akoglu, 2018). The results shows presence of a positive and significant relationship between supply chain responsiveness and waste management as proved by the p-value and the correlation coefficient ($r=0.310$, $p<0.05$). Usually waste within the supply chain makes the supply chain sluggish to react and respond to societal needs. Inefficiency in activities because of failed coordination results in poor responsiveness and time wastage in the acquiring of the items needed for a particular disaster.

Regression Analysis Results

The research used regression analysis to establish the linear statistical relationship between independent and dependent variables of this study. The two hypotheses as stated in this study were tested using regression models.

a) Test of Hypothesis 1: Supply Chain Responsiveness and Performance of HAOs

A correlation analysis for the construct, supply chain responsiveness was conducted to find out how supply chain responsiveness correlated with performance of HAOs. Correlation coefficient can range from -1.00 to +1.00. The value of -1.00 represents a perfect negative correlation whereas that of +1.00 represents a perfect positive correlation. A value of 0.00 indicates absolute absence of a relationship between variables being tested (Akoglu, 2018). Table 4 shows that the Pearson correlation coefficient was 0.765. These findings indicate that there is a strong positive linear relationship between supply chain responsiveness and performance of HAOs.

Table 4: Correlation Analysis for Construct Supply Chain Responsiveness

Variables		Performance of HAOs	Supply Chain Responsiveness
Performance of HAOs	Pearson Correlation	1	.765**
	Sig. (2-tailed)		.000
	N	290	290
Supply Chain Responsiveness	Pearson Correlation	.765**	1
	Sig. (2-tailed)	.000	
	N	290	290

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

* . Correlation is significant at the 0.05 level (2-tailed).

The researcher conducted regression analysis to examine the influence of supply chain responsiveness on the performance of HAOs. The hypothesis to test for this specific objective was:

H₀: Supply chain responsiveness does not significantly influence the performance of humanitarian aid organizations in Kenya.

The histogram in Figure 2 indicates that the data was normally distributed. The residual describes the error in the fit of the model to the i^{th} observation y_i and are used to provide information about the adequacy of the fitted model. According to Wogi, Wakweya and Tesfay (2018), analysis of the residual is frequently helpful in checking the assumption that errors are normally distributed with constant variance and in determining whether additional terms in the model would be useful.

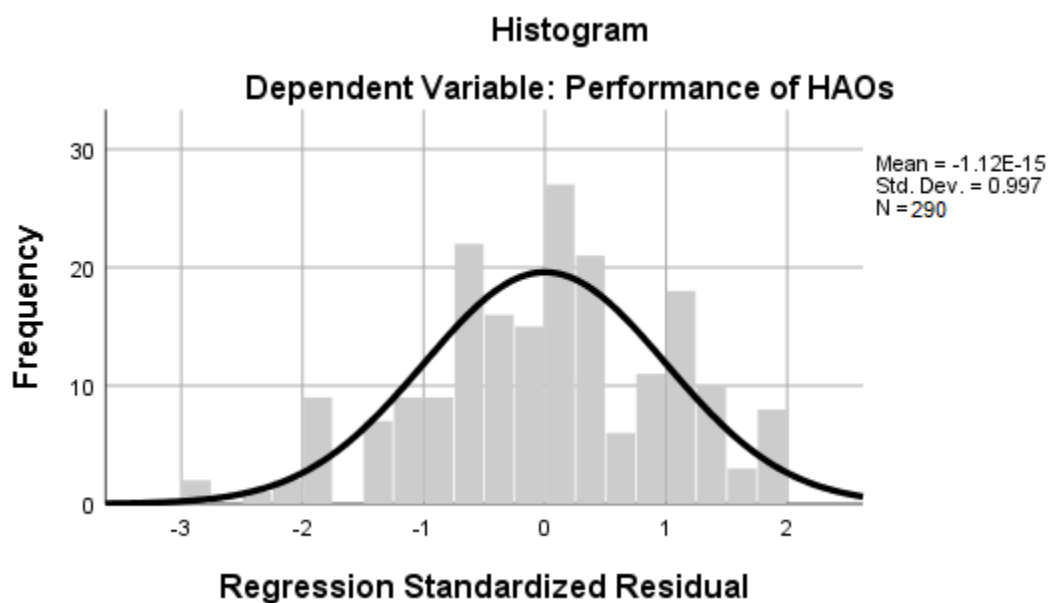


Figure 2: Histogram supply chain responsiveness on performance of HAOs

The linear regression model shows $R^2=0.585$ which means that about 58.5 percent of the total variance in the performance of HAOs in Kenya can be explained by supply chain responsiveness. The result is shown in Table 5.

Table 5: Model Summary of Supply Chain Responsiveness

Model	R	R Square	Adjusted Square	R	Std. Error of the Estimate
1	.765 ^a	.585	.579		.74484

a. Predictors: (Constant), Supply Chain Responsiveness

b. Dependent Variable: Performance of Humanitarian Aid Organizations

Further test on the ANOVA shows that the significance of the F-statistic ($p<0.05$) is less than 0.05 as indicated in Table 6. This is an implication that supply chain responsiveness has a significant influence on performance of HAOs.

Table 6: ANOVA of Supply Chain Responsiveness

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	7.439	1	7.439	12.099	.000 ^b
	Residual	177.081	288	0.615		
	Total	184.52	289			

a. Dependent Variable: Performance of Humanitarian Aid Organizations

b. Predictors: (Constant), Supply Chain Responsiveness

Presented in Table 7 are the coefficients and t-statistic of the resulting model. The constant term $\beta_0 = 5.77$, implies that if supply chain responsiveness is held constant, then there will be a positive performance of HAOs in Kenya by 5.77. The regression coefficient for supply chain responsiveness was positive and significant ($\beta_1 = 0.224$, $p<0.05$), with a t-value of 3.556. This implies that for every unit increase in supply chain responsiveness, performance of HAOs is predicted to increase by 0.224 units.

Table 7: Coefficients of Supply Chain Responsiveness

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std.	Beta		

		Error				
1	(Constant)	5.770	0.477		12.101	0.000
	Supply Chain Responsiveness	0.224	0.063	0.765	3.556	0.000

a. Dependent Variable: Performance of Humanitarian Aid Organizations

Performance of Humanitarian Aid Organizations = 5.770 + 0.224 Supply Chain Responsiveness

From the results in Table 4 to Table 7 above, the null hypothesis that supply chain responsiveness does not significantly influence the performance of humanitarian aid organizations in Kenya, is rejected. This result revealed that supply chain responsiveness contributes positively towards performance of HAOs in Kenya. Humanitarian organizations normally operate in unstable environments, necessitating strategies that enhance their response to risks and uncertainties in demand, supply and processes (Jahre, 2017). This calls for readiness, swift disposition of the needed resources, and capacity to cope proficiently in different settings. Extant research (Ganguly, Padhy and Rai, 2017; Behl and Dutta, 2019; Agarwal, Kant and Shankar, 2019) argue that the operational performance of humanitarian supply chains relies on their ability to respond swiftly to the needs of vulnerable populations and undertake dynamic operations. For this to be possible, humanitarian supply chains must be responsive, amenable and efficient. Sharing the same view is Munyoro (2020) emphasizing that proper response to the humanitarian needs in case of disasters is considered to be mitigation and satisfying the initial and vital needs of the survivors and thus must be done in the shortest time using the least amount of the resources to reduce the terrible effects of the disaster.

b) Test of Hypothesis 2: Waste Management and Performance Of HAOs

A correlation analysis for the construct waste management was conducted to establish how waste management correlated with performance of HAOs. Table 8 shows that the Pearson correlation coefficient was 0.661. These findings indicate the presence of a strong positive linear relationship between waste management and performance of HAOs

Table 8: Correlation Analysis for Construct Waste Management

Variable		Performance of HAOs	Waste Management
Performance of HAOs	Pearson Correlation	1	.661*
	Sig. (2-tailed)		.000
	N	290	290
Waste Management	Pearson Correlation	.661**	1
	Sig. (2-tailed)	.000	
	N	290	290

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

* . Correlation is significant at the 0.05 level (2-tailed).

Regression analysis was conducted to determine the influence of waste management on the performance of HAOs. The hypothesis to test for this specific objective was:

H₀: Waste management does not significantly influence the performance of humanitarian aid organizations in Kenya.

The histogram in figure 3 indicates that the data was normally distributed. The residual describes the error in the fit of the model to the i^{th} observation y_i and are used to explain the adequacy of the fitted model. According to Wogi, Wakweya and Tesfay (2018), analysis of the residual is frequently helpful in checking the assumption that errors are normally distributed with constant variance, and in determining whether additional terms in the model would be useful.

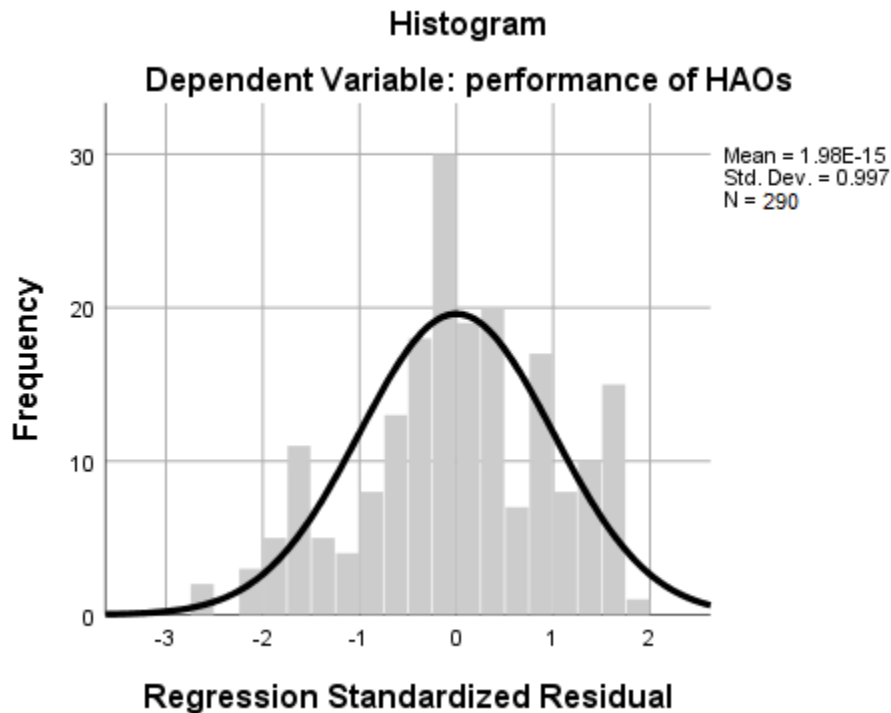


Figure 3: Histogram Waste management on performance of HAOs

Presented in Table 9 is the model summary of regression of waste management on performance of HAOs. The results show $R^2=0.436$ which means that about 43.6 percent of the total variation in the performance of HAOs in Kenya can be attributed to waste management.

Table 9: Model Summary of Waste Management

Model	R	R Square	Adjusted Square	R	Std. Error of the Estimate
1	.661 ^a	.436	.427		.78413

a. Predictors: (Constant), Waste Management

b. Dependent Variable: Performance of Humanitarian Aid Organizations

Further test on the ANOVA shows that the regression model involving performance of HAOs as the dependent variable and waste management as the predictor, is very significant at 5% level of significance (F-statistic=35.587, $p<0.05$), as indicated in Table 10. This is an implication that waste management has a very significant influence on the performance of HAOs.

Table 10: ANOVA of Waste Management

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	19.743	1	19.743	35.587	.000 ^b
	Residual	159.777	288	.555		
	Total	179.520	289			

a. Dependent Variable: Performance of Humanitarian Aid Organizations

b. Predictors: (Constant), Waste Management

Further, Table 11 presents the coefficients and t-statistic of the resulting model. The constant term $\beta_0 = 4.490$, implies that if waste management is kept constant, then there will be a positive performance of HAOs in Kenya by 4.490. The regression coefficient for waste management was positive and significant at 5% level of significance ($\beta_1 = 0.547, p < 0.05$), with a t-value of 5.965. This is interpreted to mean that for every unit increase in waste management, performance of HAOs is predicted to increase by 0.547 units.

Table 11: Coefficients of Waste Management

Model		Unstandardized Coefficients	Std. Error	Standardized Coefficients	T	Sig.
		B		Beta		
1	(Constant)	4.490	.376		11.949	.000
	Waste management	.547	.092	.661	5.965	.000

a. Dependent Variable: Performance of Humanitarian Aid Organizations

Performance of Humanitarian Aid Organizations = 4.490 + 0.547 Waste Management

From the results in Table 8 to Table 11 above, the null hypothesis that waste management does not significantly influence the performance of humanitarian aid organizations in Kenya, is rejected. This result revealed that waste management contributes positively towards performance of HAOs in Kenya. The findings of this study are in line with Balle, Jones, Chaize and Fiume (2017) that for organizational effectiveness and for gaining competitive advantage in cost, it is necessary for the organization to eliminate waste. In general, waste is the failure to add, or is a barrier to adding, value for the customer/beneficiary.

Conclusion

From the study findings, it could be concluded that supply chain responsiveness had a positive significant influence on performance of humanitarian aid organizations in Kenya. The study showed that there was a strong relationship between supply chain responsiveness and performance of HAOs. The findings of the study revealed that humanitarian aid organizations in Kenya have supply chains designed to be responsive to the needs of vulnerable populations. The humanitarian supply chains are designed to evaluate, consider and cover needs of vulnerable people quickly while enabling a view of the movements of materials along the supply chains. However, the ability of humanitarian supply chains to respond quickly to emergencies and disasters is a challenging task influenced by various challenges facing humanitarian supply chains. This means that despite the supply chains being designed to be responsive to emergencies, there is still an element of sluggishness in most humanitarian supply chains in

Kenya resultant from the challenges faced. This shows lack of preparedness by humanitarian aid organizations in responding to emergencies and disasters. Supply chain responsiveness reduces the time taken to respond to emergencies hence saving many lives and improving resource utilizations by the aid organizations.

Equally, it could be concluded that waste management had a positive influence on performance of humanitarian aid organizations. Waste management is a continuous exercise in humanitarian supply chains involving identification of non-value adding activities in the supply chains and eliminating them. Minimization of wastages enhances resource utilizations in the organizations. Majority of the organizations had managed to eliminate the non-value adding operations in their supply chains but still some humanitarian aid organizations were yet to. One of the major objectives of humanitarian supply chains is adeptness and scaling down the use of rare resources, as this goes against the aim of humanitarian supply chains of saving as many lives as possible. Internal control mechanisms including audits boost effective resource utilizations. Concisely, most humanitarian aid organizations had partially implemented leagility design in their supply chains knowingly or unknowingly. Despite the implementation of supply chain leagility, humanitarian aid organizations still witnessed elements of sluggish response, wastage in the supply chains and disruptions of the chains, all affecting the efficient and effective handling of emergency assistance.

Recommendations of the Study

Humanitarian aid organizations operate in a volatile, uncertain, complex and ambiguous environment due to changing needs of vulnerable people. To achieve and sustain a supply chain that is responsive to the changing needs and volatile environment, there is a need for organizations to design and implement a supply chain that incorporates agility and lean operation across the value chain. Humanitarian aid organizations are recommended to improve their supply chain leagility by exploring and adopting advanced and emerging technologies such as big data analytics, internet of things, cloud computing, machine learning, artificial intelligence and block chain. Furthermore, it is advisable for humanitarian aid organizations to explore hybrid supply chain approach that allows it to switch between agile and lean depending on market dynamics and environment.

It is paramount that Kenya stays prepared to minimize the effect of calamities on people and sources of livelihood. While resource allocations for disaster preparedness are increasing, [the culture of preparedness in Kenya is lacking](#). There is no legal framework and no clear coordination across different types of disaster or across actors. Developing Standard Operating Procedures containing many types of disasters is a vital approach that should be prioritized by the Kenyan government. Operating hand in hand with implementing agencies ensures all parties benefit from preparation. Once formulated, these procedures should be restructured from time to time to replicate new observations and internal and external changes.

The findings of this study established that most humanitarian aid organizations had knowingly or unknowingly partially implemented leagility design in their supply chains. This study therefore recommends that supply chains managers should fully adopt leagility design in their humanitarian supply chains. The supply chain professionals should establish strategic collaborative working partnerships and agreements with industry players and experts for example seasoned global freight forwarders, ocean carriers, airlines, overland transporters, critical suppliers and all other humanitarian supply chain actors to allow expertise and near

precision responsiveness to needs. Each one of these players apply their operational expertise, assets and networks to what they do best hence creating a leagile supply chain.

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