

A leaner, meaner lifeline: How supply chain efficiency boosts the performance of humanitarian aid in Kenya

Erastus Kiswili Nyile 

School of Business and Economics, Murang'a University of Technology,
Murang'a, Kenya
nyileras@gmail.com



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Abstract: *Purpose:* This study examines how supply chain efficiency influences the performance of humanitarian aid organizations in Kenya, focusing on the moderating role of organizational characteristics such as size, age, and structure. *Methodology:* A mixed-methods approach was employed, combining quantitative data from a census survey of 330 humanitarian organizations with qualitative insights from supply chain managers. Data were analyzed using descriptive statistics, regression analysis, and thematic content analysis to assess supply chain efficiency's direct and moderated effects on organizational performance. *Results:* Findings reveal that supply chain efficiency significantly impacts the performance of humanitarian aid organizations ($\beta=0.547$, $p<0.05$), accounting for 43.6% of the variance in performance. When organizational characteristics are included, the explanatory power increases to 66.5%. Qualitative analysis highlights that waste elimination, cost optimization, and robust internal controls are critical for improving efficiency. Corruption and diversion of resources were identified as key forms of waste, while mechanisms such as audits and checks and balances effectively mitigate these issues. *Theoretical Contribution:* The study extends the Theory of Constraints to the humanitarian context, demonstrating that addressing organizational bottlenecks and inefficiencies can substantially enhance aid delivery outcomes. It also integrates lean supply chain principles into the unique challenges of humanitarian logistics. *Practical Implications:* The results underscore the importance of adopting lean management practices, investing in modern supply chain technologies, and tailoring supply chain strategies to organizational characteristics. These actions can enhance responsiveness, accountability, and resource utilization, ultimately improving the impact of humanitarian operations in crisis settings.

Keywords: supply chain efficiency, supply chain waste elimination, cost optimization, process improvement

Sustainable Development Goals (SDGs): SDG 2: Zero Hunger; **SDG 3:** Good Health and Well-being; **SDG 10:** Reduced Inequalities; **SDG 11:** Sustainable Cities and Communities; **SDG 12:** Responsible Consumption and Production

1. Introduction

Supply chain management has become a common art, and organizations outflank each other in competition (Jackson, 2018). Efficient supply chain management is a puzzling and complex role because currently, diverse brands are on the rise, products' life cycles are reducing, most companies are now adopting outsourcing strategies, globalization of business is on the rise, and advancement of information technology is becoming tremendous (Holweg, 2018). Additionally, the composition of the supply chain impacts the utility and price of a commodity all through its existence in the market. Organizations are trying to obtain the highest possible performance from their supply chains by utilizing varied means in the contemporary period (Chan, Ngai & Moon, 2017). A competitive edge can be achieved with no doubt when a company has adopted an efficacious supply chain strategy and design by utilizing its capabilities in the supply chain to realize flexibility, rapid response, and efficient cost. Concerning the rising relevance of supply chain management, the competitive focus deviates from rivalry among organizations/firms to contest supply chain supremacy in the 21st century. Korpela, Hallikas, and Dahlberg (2017) emphasized that an effective and efficient supply chain design could guarantee a secure spot in competition. An organization can consolidate all its resources to enhance the movement of the products over stream value to achieve the needs of consumers if its supply chain design is appropriate (Hugos, 2018). Several studies have come up with various supply chain designs, which are mutually exclusive or even collectively exhaustive, to address the aspect of efficiency.

Conversely, natural and artificial catastrophes and crises have increased in magnitude and frequency in recent years. According to the United Nations, natural calamities in the coming years will increase in severity and frequency and have damaging effects (Montz, Tobin & Hagelman, 2017). Humanitarian supply chains provide services in emergencies during disasters by providing 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 the efficiency and effectiveness of humanitarian operations (Papadopoulos *et al.*, 2017). Failure to achieve effectiveness and efficiency after a disaster strike can lead to loss of lives, undesirable media coverage, and loss of important donor funding required for future operations (Adem *et al.*, 2018).

Humanitarian organizations are wide and varied, each with its organizational structure, ways of operating, communicating, and making decisions. Offering a rapid and appropriate response during humanitarian disasters can be a herculean task requiring complex coordination. Challenges to humanitarian logistics include physical destruction, which limits logistical pathways; constrained resources, which limit funding during the disaster; and federated organizational structures, which result in autonomous, under-defined, and non-unified operations. Emergency response must be timely, effective, appropriate, and well-organized to save lives and alleviate suffering. This is where supply chain managers play a key role. The supply chain is central to humanitarian relief. The speed and efficacy of relief programs depend on the ability of supply chain managers to procure, transport, receive, and distribute supplies to the site of relief efforts (Rashid, 2018).

Humanitarian supply chain professionals worldwide are faced with the challenge of designing proper supply chains that meet the objective of delivering value and aid to vulnerable people while simultaneously satisfying donors and funders expectations. This is because of the increase in humanitarian disasters worldwide. The exercise of planning, implementation, and controlling of the systematic, feasible movement and storage of goods, materials, and associated information from the original point to consumption point to mitigate the suffering of vulnerable people is termed a humanitarian supply chain (Khan, Yong & Han, 2019).

Olaogbebikan and Oloruntoba (2017) identified resemblances between commercial and humanitarian supply chains. In contrast, Dubey and Gunasekaran (2016) described emphasis on life and

death in place of profit and loss, unpredictability and the necessity to hastily change preference, and many players in the field as unique characteristics of humanitarian supply chains. Humanitarian supply chains involve the flow of aid from donors to the beneficiaries. Additionally, humanitarian supply chains focus on vulnerable populations and their needs, unlike commercial supply chains, which deal with customers' predictable demands and marketplace structures (Khan, Yong & Han, 2019). Predominantly, these commercial supply chains are focused on financial savings, not saving human lives; assume highly controlled communication networks and predictable demand, not the chaos of disasters; and are oriented to serving customers who are both decision-makers and recipients, versus the highly complex relations of response experienced in humanitarian supply chains.

There is a need to manage and oversee calamity supply chains to guarantee that humanitarian aid organizations benefit from having a supply chain framework set up. The humanitarian supply chain is designed to show that humanitarian aid organizations are not exploited even when acquiring goods and services in emergencies. Worldwide, supply chain experts are in a persistent quest for new and inventive methods for building productive and successful supply chain designs that will adjust to quick changes in catastrophic situations considering the costs. Supply chain efficiency is anchored on the concept of lean. The development of the lean concept is credited to Toyota Company and largely the Toyota Production Systems. Lean aims to do more with less (Mostafa & Dumrak, 2017). The lean concept is essentially a combination of administrative operations emphasizing eradicating waste in the supply chain, inside and beyond organizations (Bortolotti *et al.*, 2016). Biazzo, Panizzolo, and Crescenzo (2016) believed that the basic principles of lean entail identifying, creating value, alleviating waste, and generating flow. Consequently, the starting point towards developing leanness is identifying value and defining value propositions for the customer or consumption points (York, 2018). Mourtzis, Papathanasiou, and Fotia (2016) classified the processes within a supply chain into value-adding, non-value-adding, and necessary but not value-adding.

Companies are trying to reduce inefficiencies in their supply chain to achieve competitive advantages. Cost reduction and low wastage are the focus of lean supply chain management. Moreover, organizations with low varieties but high volume purchases stand a high chance of benefiting from using lean supply chain practices. Lean supply chain management is not limited to manufacturing companies but can also be adopted by organizations to streamline their processes to reduce wastage and activities that add no value. There are several areas in the supply chain where waste in terms of time, cost, and inventory can be singled out. (Christopher, 2016). The lean paradigm functions optimally in a predictable demand, where accurate forecasts can be made. By eliminating all forms of waste, lean systems have a competitive edge based on quality and cost. Humanitarian supply chains characteristically hold various items needed by aid recipients and usually experience loss of products due to theft, misappropriation, poor tracking and control, and product deterioration (Mohammed, 2018). Supply chains are imperative in mitigating destruction caused by disasters by delivering items to those in need and ensuring that recovery operations are carried out smoothly (Banikoi *et al.*, 2018). According to Cockton, Lárusdóttir, Gregory, and Cajander (2016), the lean approach offers the opportunity to accomplish more with less while heading closely to customer/user satisfaction. Christopher (2016) highlights the importance of this philosophy, indicating that the firm's viability largely depends on how well it can respond to customers' needs while remaining lean. Previously, supply chains were designed to achieve service optimization and minimize costs. This is different today as more emphasis is put on supply chain resilience, which is described as the capability of the supply chain to adapt to abrupt occurrences to proficiently counter the unfavorable impacts of the occurrence (Dufour *et al.*, 2018).

1.1. Performance of humanitarian aid organizations

Weiss (2018) described a humanitarian as one who is sternly involved in advocating for the well-being of all humankind without bias on grounds of gender, ethnicity, sexual orientation, religion, or race. The goal of a humanitarian is to salvage lives, alleviate affliction, and uphold human decency (Weiss, 2018), achieved by liberation and protection of refugees, housing and feeding people experiencing homelessness, or promoting recovery from the after effects of natural disasters and civil disorder. Humanitarians combat disease, famine, and unrest even if it means taking risks in unfriendly localities and weather and persisting even when the risks of abduction, death threats, loss of lives, and other forms

of abuse from some unfriendly societies. Humanitarians uphold the well-being and opinions of all people, facilitate change in human behavior, and offer assistance in the form of money and other necessities to those in need. The necessities can be food, clothing, housing, equipment, and medical supplies, and they can help the victims calm down in distressful and miserable situations (Collier & Betts, 2017).

Humanitarian organizations with efficient SCM systems gain from precise, accountable, fair and accurately documented procurement processes. Generally, the performance of not-for-profit entities depends on their capability to raise funds to fulfill their goals and objectives (Mangan & Lalwani, 2016). As per the findings of Clarke (2018), humanitarian organizations need to focus solely on presently required monetary resources and have an exclusive concentration on fundraising as well as financial indicators, as this can shift the attention from other facets of performance associated with output, effectiveness, quality in addition to client satisfaction. The authors observe that measures often are concerned with the outcome of organization activities, measured through assessment of the activities' general impact in addition to efficiency and efficacy as pertains to resources expended.

Various researchers have come up with metrics that can be utilized in assessing humanitarian performance. According to Maghsoudi and Pazirandeh (2016), resources, output, and flexibility metrics can be utilized to assess the efficiency, effectiveness, and ability to respond to a varying environment. Conversely, Wei (2019) developed a framework for examining the financial performance of humanitarian entities. The framework comprises fundraising efficiency, public support and expenses, and cost efficiency. In the same way, the standards for Charity Accountability of the Better Business Bureau came up with a framework to measure the performance of NGOs. Their framework assesses performance in aspects such as financial effectiveness and governance. In the model, the financial aspect is not exclusively represented by fundraising efficiency but entails managing and producing concise and accurate financial statements and budgets. American Association of Retired Persons (AARP), as cited by Ramadan and Borgonovi (2015), also devised an NGO performance measurement model consisting of organizational leadership and integration, resources and stewardship, and social impact value.

In Kenya, humanitarian entities rely heavily on donor funding to roll out their operations, leading to the responsibility to be accountable (Pocock & Whitman, 2016). The procurement processes for such entities are subject to periodic audits as they aim at obtaining internal and external assurance of observance of value for money and accountability principles (Pocock & Whitman, 2016). Consequently, with increased funding attributed to the rising number of disasters, accountability, transparency and value for money are becoming critical to donors. The primary role of the humanitarian supply chain encompasses getting value for money, attaining competence and potency, fostering fair competition among the vendors, and enhancing answerability, openness, and ethics. This differs from the private sector entities whose primary objective is profit maximization. Over the past decade, humanitarian entities have experienced increased pressure from donors who require them to provide proof of meeting their objectives efficiently and effectively. As donors develop more involvement in expenses, humanitarian organizations face increased scrutiny regarding monitoring the impact of aid, not merely the input and output but the entire operation (Gorman, 2019). Consequently, organizations must develop a more effective result orientation, accountability, and transparency.

1.2. Statement of the problem

The preparedness and the capability of humanitarian aid organizations to act in the face of disasters and have proper and efficient supply chain coordination is moot (Shareef, Dwivedi, Mahmud, Wright, Rahman, Kizgin & Rana, 2019). This concern arises due to the increasing number of emergencies putting pressure on humanitarian aid organizations to deliver aid appropriately (Olaogbebikan & Oloruntoba, 2017). Kenya's ASALs (vulnerable to hazards) make up more than 80% of Kenya's landmass, supporting nearly 30% of the total human population (Njoka *et al.*, 2016). About 70% of the disasters in Kenya are hydro-meteorological, particularly droughts, floods, and disease outbreaks, among others. This calls for responsive and robust humanitarian supply chains to deliver aid, when needed, in a timely and efficient manner to vulnerable populations upon colossal donor funding (Njoka *et al.*, 2016).

Despite the enormous chunks of money pumped into the humanitarian sector, stringent oversight by donors, and expectations from vulnerable populations, humanitarian supply chains still respond

sluggishly, inefficiently, and poorly coordinated to emergencies (Paul, 2019). Approximately 80% of disaster and relief operations involve supply chain activities, underscoring the centrality of logistics and supply chain management in effective humanitarian response (Maghsoudi, Zailani, Ramayah, & Pazirandeh, 2018). Therefore, the poor performance of humanitarian aid organizations is attributed to poor management of their supply chain operations (Bealt *et al.*, 2016). Thus, the inference is 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. Jahre (2017) described humanitarian supply chains as multiple, global, dynamic, and temporary. This is because these supply chains face unpredictability and intricacy that is as if not greater than that faced by commercial-world supply chains. They involve a wide set of collaborators from both private and public sectors, with little systemization. This makes them less active and efficient than their commercial cousins. Le Pennec and Raufflet (2018) added that the environment in which humanitarian aid organizations operate is volatile, with high chances of disruptions. The humanitarian operation is further bungling due to the absence of joint planning and inter-organizational collaborations. Moreover, little is known about the moderating effect of organizational characteristics. Investing in better performance of humanitarian supply chains could have a profound and lasting impact on society (Wagner & Thakur-Weigold, 2018). This study aimed to bring efficacy into the humanitarian sector by looking into the concept of supply chain efficiency. Previously, the lean and agile paradigms were studied separately, with dominance on humanitarian operations' agile side (rapid response). This inclination towards agile process and effectiveness procedures negated the need of lean processes and efficiency procedures and made supply chain efficiency an observable gap.

1.3. Objectives of the study

- a) To determine the influence of supply chain efficiency on the performance of humanitarian aid organizations in Kenya.
- b) To determine the moderating effect of organizational characteristics on the relationship between supply chain efficiency and performance of humanitarian aid organizations in Kenya.

1.4. Research hypotheses

H₀₁: Supply chain efficiency does not significantly influence the performance of humanitarian aid organizations in Kenya.

H₀₂: Organizational characteristics does not moderate the relationship between supply chain efficiency and the performance of humanitarian aid organizations in Kenya.

2. Theoretical framework

A theory can be explained as a set of interlinked concepts, definitions, and prepositions that present a systematic view of a phenomenon through specifications of interactions among variables to explain and predict phenomena (Creswell & Creswell, 2017). This study will be anchored on the Theory of Constraints.

2.1. Theory of constraints

The theory of constraints, whose proponent is Eliyahu Goldratt, is a methodology used in identifying the most critical limiting factor or constraint hindering the attainment of a goal through systematic advancement of constraint until it is no longer a limiting factor (Goldratt, 1990). The theory construes that managers need to focus primarily on efficiently managing capacity and capability of the limited number of constraints in the organization where the organization's performance is fostered. The key notion of the theory is that constraints limit the performance of any system within the organization. This theory assumes a scientific viewpoint to advancement and that all complex systems encompass numerous linked activities, among them constraints to the entire system. To assist in attaining system goals, the theory advances a methodology for identifying and eliminating constraints, tools for analyzing

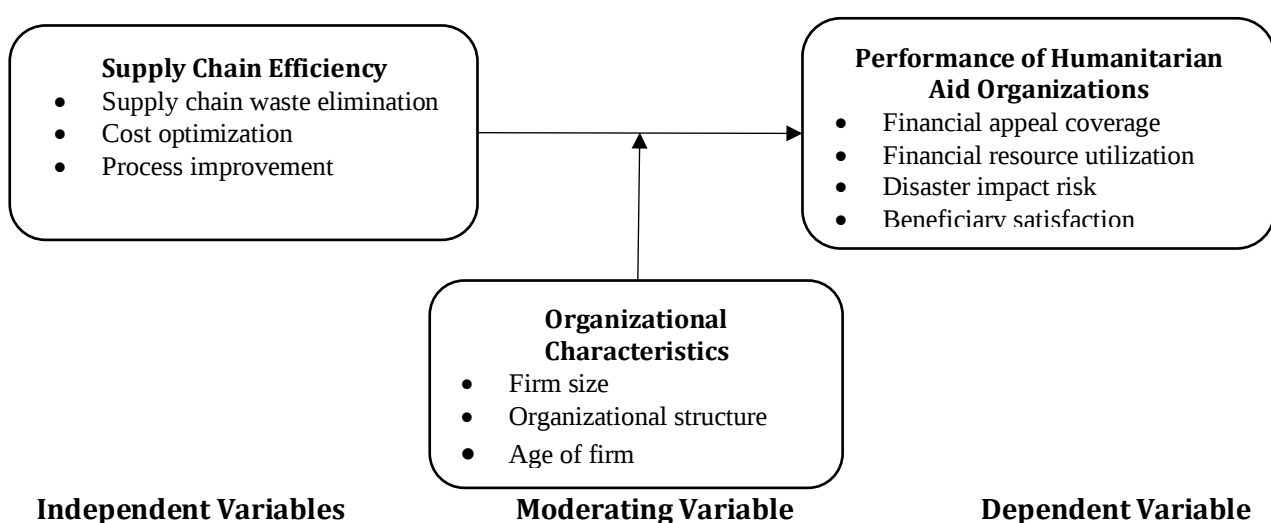
and resolving problems, and a method of performance measurement and guidance of management decisions (Goldratt, 1990).

This theory treats the supply chain as a system, a group of connected components that operate together to convert investment to value per the expectations. The theory focuses on comprehension and handling of constraints between an organization and attaining its goals. Therefore, it provides the necessary resources that humanitarian supply chains can effectively use to increase their productivity and reliability (Rudnicki, 2011). The supply chain efficiency paradigm upholds the convergence of accessible resources, the basic notion of exploiting constraints in a supply chain. Supply chain efficiency principles can be applied to maximum advantage in humanitarian supply chains to eliminate waste, trim costs, compress lead times, boost amplitude, foster adaptability, and improve flexibility. This undoubtedly fosters humanitarian performance by ensuring optimum resource utilization, increasing saved lives, meeting time, expenditure targets, and needs of aid recipients, and enhancing the impact of activities and projects. The theory of constraints in this study helps understand the supply chain efficiency objective. According to the theory, organizations need to identify the most limiting factor or constraint standing in the way of realizing an objective and then analytically refine the constraint until it is no longer a limiting factor. The theory views waste and inefficiencies as the most significant constraints on opportunity and, thus, the need to be managed and eliminated for the performance of humanitarian aid organizations.

2.2. Conceptual framework

A conceptual framework denotes a model of presentation in which the researcher conceptualizes or provides a presentation or association among variables in the research and depicts this association graphically or figuratively (Merriam & Grenier, 2019). As espoused by Creswell and Poth (2017), a variable is a measurable feature that assumes varied values in the context of units of a given population. The primary variables in the present study are categorized as either independent or dependent variables. As Creswell and Poth (2017) explained, independent variables are also predictor variables due to their prediction of the amount of variation occurring in another variable. Conversely, dependent variables, also known as criterion variables, are those that are either influenced or changed by another variable. The dependent variable is the one that the researcher aims at explaining. Consequently, this study aimed to establish the influence of supply chain efficiency on the performance of humanitarian aid organizations in Kenya, with organizational characteristics as the moderating variable.

Figure 1: Conceptual framework



2.3. Supply chain efficiency

Vaishnavi and Suresh (2020) outline that one of the most important motives for adopting leanness is to increase efficiency through eradicating waste and process optimization (leanness), which are

important to humanitarian and commercial organizations. According to Shafiq and Soratana (2020), leanness is characterized by waste optimization through adopting more efficient processes. Lean strategies typically aim at minimizing cost by "doing more with less". This includes process optimization and value stream analysis techniques. Both commercial and humanitarian supply chains aim to develop increased efficiency by eliminating waste in the unpredictable nature of humanitarian supply chain, making it challenging to reduce waste completely along the supply chain. Through continuous improvement measures, however, humanitarian organizations can continually improve how they manage their waste (Olaogbeikan & Oloruntoba, 2017).

The lean concepts can be considered a set of managerial practices focusing on eliminating waste in the entire value chain, within and across firms (Muchiri, 2017). According to Osore, Ogola, and Ogot (2020), the most basic principle of lean is identifying and enhancing value, eliminating waste, and generating flow. Consequently, the first step in becoming lean is identifying and defining value prepositions for clients (Mwangi & Kamau, 2019). Given the importance of discovering values and wastes, it is critical to understand how they should be determined. Olaogbeikan and Oloruntoba (2017) classify waste into value-adding, non-value-adding, and necessary but not value-adding. Keyte and Locher (2016) describe the value-adding process as converting raw materials or semi-finished products into products. On the other hand, the non-value-adding processes are unnecessary and should be eliminated. The necessary but not value-adding processes are non-beneficial yet essential in the current design, necessitating extensive changes in the process design to do away with them.

It has been established that waste does not add any value. Thus, when it occurs, the quality and reliability of the supply chain is threatened. Consequent to this hazard, a methodical detection of the gain and waste must be determined using value identification and stream mapping techniques. Value stream mapping signifies a set of actions needed to bring a product through the production processes, from raw materials to the final consumer (Keyte & Locher, 2016). Information and material flow in the context of the supply chain are considered by value stream mapping to identify all forms of waste in the value stream and take action to eliminate such waste (Keyte & Locher, 2016). Furthermore, value stream mapping fosters the likelihood of working on a lasting resolution instead of individual processes. Value stream mapping generates a sturdy groundwork for the primary processes, promoting more astute decisions for the unending improvement of the value stream (Sweeney & Business, 2017).

In a commercial logistics context, the objective is to minimize logistics costs, whereas in a humanitarian logistics context, the objective is to minimize human suffering (Tull, 2020). However, estimating the cost of ethical and computational suffering is difficult. A qualitative assessment of the cost-effectiveness of humanitarian aid to Somalia concluded that the same results could not have been achieved for 'less effort and investment,' stating that a lower financial cost would have come at the expense of lives. However, there is no quantitative data available to support this. There is little publicly available information on the required infrastructure and operational costs in humanitarian settings (Roblin, 2019). In practice, the recording of logistics costs is still limited (Hein et al., 2020).

Supply chain and logistics account for between 60% and 80% of the total expenditure of any humanitarian intervention. Therefore, more cost-effective humanitarian aid is needed than ever (Besiou & Van Wassenhove, 2020). A new logistics chain is set in motion each time a crisis arises. However, research shows that logistics operations in isolation, e.g., where each non-government organization (NGO) has its own logistics operation, are no longer tenable (Radosta, 2019). Humanitarian logistics research states that to meet humanitarian outcomes cost-effectively, a change in operational strategy is needed, moving from a model of fundraising and using funds to a model of fundraising and optimizing these funds (Lacourt & Radosta, 2019). The supply chain must also become strategic to become part of the decision-making process, starting early from the assessment and programming stages (Lewin et al., 2018; Lacourt & Radosta, 2019).

2.4. Organizational characteristics

Organizational characteristics are the features originating both from the management model adopted by the organization, through its structure or strategy, and the organizational perception resulting from the complexion of its membership and external affiliations. Some important organizational factors that affect the performance of humanitarian aid organizations include organizational size, organizational structure, and the firm's age in that industry (Mutebi, Ntayi, Muhwezi

& Munene, 2020). Olaogbebikan and Oloruntoba (2017) established a positive relationship between firm size and performance in their research using a simpler form of the model. However, they applied different measures of size (sales and total assets) and profitability (profit margin and profit on total assets). Isik, Unal, and Unal (2017) gauged the impact of firm size on profitability using the Turkish manufacturing sector as the sample. The study revealed an irrefutable relationship between the size and performance of the firm. Wayongah (2019) evaluated the relationship between the size and profit of firms operating in the financial services sector. The author uncovered the unfavorable impact of firm size on the profit margin. Hence, when humanitarian organizations adopt supply chain efficiency, the influence on performance is likely to be affected by the firm's size.

Organizational structure is also an element that affects the performance of humanitarian firms. Organizational structure refers to an institution's supervision, departmental makeup, and workflow. Performance management systematically improves an individual or group's productivity by setting goals and conducting performance assessments. A firm's structure can substantially impact performance management methods and policies, and organizational performance targets should determine the company's approach. Comprehension of these two concepts can help establish an organizational structure's most effective performance management system. Organizational structure focuses on the layout of units and functions in an organization in the frame of reporting relationships. The complexity of a company can be illustrated as a top-down flowchart, with each connected node epitomizing a separate position in the firm reporting to the post directly above and possibly administering the positions below it. Considering that, performance management majors on relationships between administrators and their juniors. Organizational structure can be used to determine which positions should be responsible for oversight and assessment of other positions.

2.5. Performance of humanitarian aid organizations

Donors increasingly demand accountability, transparency, and value for money regarding the resources available in exchange for the patronage of humanitarian aid agencies (Bhatta, 2019). They are interested in knowing how successful an organization is in accomplishing its goals with the resources they have provided. According to Dubey and Gunasekaran (2016), aid should be relevant to human standards, properly administered, and consistent with components that discourage deficiency. It should provide lasting solutions and be sufficiently resourced. This explains why mechanisms for measuring the performance of humanitarian organizations are of paramount relevance. Multiple stakeholders' priorities differ, making it challenging to define humanitarian organizational performance (Khan, Yong & Han, 2019).

Moving the above idea to application in humanitarian supply chains, donors and beneficiaries are two types of clients. The donor is the upstream client, and the beneficiary is the downstream client as per the flow of resources. As per the monetary reliance of humanitarian organizations on their upstream clients (donors), they have comparably much right of decision power. Nevertheless, the humanitarian operational capability is defined by their ability to balance the needs of the downstream (beneficiaries) and the demands of the upstream (donors). Few studies address humanitarians' performance management. Empirically, there is a dearth of tools available for measuring the performance of humanitarians as per ISO and other standards. This means that the operational gap in integrating effectiveness and efficiency into efficacy has been reflected on the management side regarding agility, leanness, and leagility. This operational gap, management practices lapses, and lack of integration of the two sides of the same coin is imperative for sustainable development in humanitarian organizations performance uplift globally, yet ignored until now (Shafiq, Akhtar, Tahir, Akhtar & Kashif, 2021).

The overall performance of a non-profit organization relies solely on its capacity to raise funds to fulfill its mission and goals (Şanal & Nsubuga, 2018). Osei (2017) argues that humanitarian organizations should not put too much attention on current financial resources and should give absolute attention to raising funds as this leads to the misplacement of priorities, including output, effectiveness, quality, and client satisfaction. He upholds that adjustments often focus on the outcome of organizational activities, which are determined by assessing the bearing of the activities performed along with their efficiency and efficacy regarding resources spent. Different scholars have derived metrics to measure humanitarian performance. Kweni, Mukulu, Nzulwa, and Odhiambo (2020) outlined

a three-part performance measurement of resource, output, and flexibility metrics, measuring efficiency, effectiveness, and ability to respond to a changing environment.

Performance measurement is the first step in improving humanitarian logistics operations. Moreover, despite its significance, performance measures and measurement systems have not been widely developed and systematically implemented in the relief chain. In addition to the common problems in the non-profit sector, such as performance criteria ambiguity, the inherently unique characteristics of the disaster relief environment make relief chain performance measurement even more challenging (Frennesson, Kembro, de Vries, Van Wassenhove & Jahre, 2020). Performance measurement is crucial in the humanitarian sector as numerous agencies compete for donor funding and higher demands for accountability of donors, media, and the public. According to Negi and Negi (2020), developing the proper performance measurements can assist a humanitarian organization in measuring the impacts of disasters, enhance preparedness and alleviate the impact of such disasters, and ultimately efficiently manage donor funds to maximize assistance to the beneficiaries.

While most performance measurement frameworks in humanitarian organizations are borrowed from the commercial world, many commercial performance metrics do not apply to humanitarian organizations (Patil, Shardeo & Madaan, 2020). In summary, performance measurement in humanitarian organizations is less established than in the commercial world. While there are some well-known generic frameworks for commercial firms, such as the SCOR model and the Balanced Scorecard, there is no universally accepted performance measurement framework in humanitarian organizations, and it is challenging to develop appropriate metrics (Anjomshoe, Hassan & Wong, 2019). Moreover, many humanitarian organizations do not have appropriate performance measurement metrics and those that do tend to make the mistake of employing too many metrics, which stretches their resources in data tracking and maintenance.

3. Research methodology

A survey research design was employed for this study. This research design is appropriate where a large population geographically spread is involved, which was the case in this study. The design enabled the study to apply qualitative and quantitative research approaches, as observed by Rahi (2017), to reinforce the two approaches. 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 efficiency.

The study was quantitative and qualitative, and descriptive and inferential statistics were employed. The study adopted inferential data analysis to 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 28 to facilitate the analysis of data. Inferential data analysis was done using the Pearson correlation coefficient and regression analysis. Data was also analyzed using descriptive statistics, central tendency measures, dispersion, symmetry, and inferential statistics. Linear regression analysis revealed the correlation and strength of the relationship between 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 were that if the P-value is greater than 0.05, the study fails to reject the H_0 , but if the P-value is less than 0.05, the H_0 is rejected.

4. Research findings and discussions

The researcher distributed 330 questionnaires, of which 290 were filled out and returned, with an 87.88% response rate, as indicated in Table 1. This was a perfect representation and enough to generalize the study findings. The unsuccessful response rate was 12.12%.

Table 1: Response rate

Category	Frequency	Percentage
Response	290	87.88
Non-response	40	12.12
Total	330	100.0

4.1. Descriptive statistics for supply chain efficiency

The study sought to determine the influence of supply chain efficiency on the performance of humanitarian aid organizations in Kenya. This objective was measured using the following indicators: supply chain waste elimination, cost optimization, and process improvement, as indicated in the opinion statements. Respondents were required to indicate the extent to which supply chain efficiency influenced the performance of humanitarian aid organizations in Kenya. This was on a Likert scale of not at all, small extent, moderate extent, 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 frequencies, percentages, mean, and standard deviation, as shown in Table 2 below.

Most respondents (82.4%) agreed that humanitarian supply chains emphasize reducing the wastage of resources by identifying non-value-adding activities and eliminating them. 13.8% moderately responded, while 3.8% disagreed with the emphasis. Many respondents (68.9%) also agreed that waste minimization enhances resource utilization, and waste mitigation in humanitarian aid organizations is continuously improved, increasing supply chain efficiency. As indicated in the findings, most humanitarian aid organizations (75.9%) had managed to eliminate non-value-adding operations in their supply chains, with 17.2% moderately responding. Still, 6.8% of the organizations have yet to eliminate non-value-adding operations in their humanitarian supply chains. Generally, waste mitigation in the humanitarian supply chains had improved with the onset of supply chain leagility practices.

Most respondents (65.9%) agreed that leagility creates checks and balances and allows for system use that improves the waste mitigation process in humanitarian supply chains, as 34.1% moderately agreed that leagility design of supply chains provides for checks and balances. Respondents agreed (82.7%) that humanitarian aid organizations have better value propositions through waste elimination practices. 3.4% of the respondents disagreed, and 13.8% moderately alluded to the statement.

Most respondents (75.8%) agreed that humanitarian organizations had eliminated cumbersome planning processes to create an enhanced supply chain with an improved inventory and standard operating procedures. Further, 75.9% of the respondents consented that humanitarian supply chains have a systematic approach designed to create robust, effective processes and improve existing processes to meet organizational performance goals now and in the future. The humanitarian supply chains uncover the best solutions for creating and storing inventory to deliver products and services to vulnerable populations at minimal operating costs, as indicated by 86.5% of the respondents who agreed to the statement. Lastly, 86.6% of the respondents agreed that the humanitarian supply chains employ strategic network analysis to look at various metrics, including physical facilities and inventories, costs for warehousing, transportation, labor, and distribution networks.

Table 2: Descriptive analysis of supply chain efficiency

Statements on Supply Chain Efficiency	1 %	2 %	3 %	4 %	5 %	Mean	Std Dev
The supply chain emphasizes reducing resource waste by identifying and eliminating non-value-adding activities.	0 (0)	11(3.8)	40(13.8)	160(55.2)	79(27.2)	4.06	.741
Minimization of waste enhances resource utilization and is continually improved, amounting to increased supply chain efficiency	0 (0)	10(3.4)	80(27.6)	90(31)	110(37.9)	4.03	.891
The organization has managed to eliminate non-value-adding operations in its supply chain	10(3.4)	10(3.4)	50(17.2)	140(48.3)	80(27.6)	3.93	0.946
Supply chain leagility creates checks, balances, and system use that improves the waste mitigation process.	0 (0)	0 (0)	99(34.1)	151(52.1)	40(13.8)	3.79	.664
The organization has eliminated cumbersome planning processes to create an enhanced supply chain with an improved inventory and standard operating procedures.	0 (0)	10(3.4)	60(20.7)	110(37.9)	110(37.9)	4.10	.846
Through waste elimination practices, the organization has a better value proposition	0 (0)	10(3.4)	40(13.8)	90(31)	150(51.7)	4.31	.836
The supply chain has a systematic approach designed to create robust, effective processes and improve existing processes to meet organizational performance goals now and into the future.	0 (0)	10(3.4)	60(20.7)	100(34.5)	120(41.4)	4.14	.861
Supply chains uncover the best solutions for creating and storing inventory to deliver products and services to vulnerable populations at minimal operating costs.	0 (0)	0 (0)	39(13.4)	150(51.7)	101(34.8)	4.21	.664
The supply chain employs strategic network analysis to look at various metrics, including physical facilities and inventories, costs for warehousing, transportation, labor, and distribution networks.	0 (0)	0 (0)	39(13.4)	149(51.4)	102(35.2)	4.21	.664

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

Based on the study findings in Table 2, leagility is an essential design of supply chain efficiency in humanitarian supply chains. Supply chain leagility design creates checks and balances and enables systems to use improving waste mitigation. Waste elimination is a continuous exercise in humanitarian aid organizations involving identifying and eliminating non-value-adding activities in the supply chains. Most humanitarian aid organizations have managed to eliminate the non-value-adding operations in their supply chains, but some have yet to do so. Minimization of such wastage enhances resource utilization in the organizations. The humanitarian supply chains uncover the best solutions for creating and storing inventory to deliver products and services to vulnerable populations at minimal operating costs. Ozen (2018) alluded that most humanitarian supplies fall into the category of relief items and 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's (2018) study on the analysis of lean, agile, and leagile supply chains, which states that efficiency and waste management are important aspects of the leagile supply chain. Munyalo (2020) further confirms that eliminating waste from all the supply chain elements calls for continuous improvement processes. Hassani, Ceaşu, and Iordache (2020), 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 to boost efficiency, as was the case in the findings of this study.

4.2. Qualitative analysis of supply chain efficiency

Thematically, recurrent themes were drawn from qualitative responses received from the supply chain managers, and as many potential themes as possible were manually coded to establish patterns. An examination of supply chain efficiency in humanitarian aid organizations was conducted using open-ended questions to the supply chain managers. Two items were used to seek the various forms of waste in humanitarian supply chains, and the mechanisms humanitarian aid organizations employ to minimize waste and costs in their supply chains. Much wastage is associated with humanitarian aid because the development of incessant supply chains has been ignored.

Forms of waste 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. Even when aware of a crisis, bureaucrats working at a highly sluggish pace may demand illegal payments when importing relief goods into the country and payments to speed up bureaucratic procedures. Fraudulent payments may have to be made at road checks if timely delivery is to be assured. Diversion of funds is predominantly accomplished using several methods of fraud. These were kickbacks while placing orders, making relief items procured at disproportionate prices, and acquiring relief products of a value lower than the one stipulated in the contract. Other ways of diversion of funds identified were the 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, and investing them in the meantime. Other forms of waste in humanitarian supply chains commonly identified included waiting time, unnecessary motions and transport, inappropriate processing, unnecessary inventories and defects, theft, misappropriation, poor tracking and control, and product deterioration. Indeed, this study's findings support Bader's (2020) findings that diversion of aid funds essentially reduces the quantity, quality, and appropriateness of assistance for those in need and instead serves 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 little or no scrutiny. This explains the increase in money-minting schemes by disasterpreneurs.

Mechanisms of addressing supply chain waste and costs in relief operations identified included eradicating import and tax fees. Furthermore, punishments were imposed for misuse of services, cancellations had to be done as soon as possible, and a binding clarification was made. This is to avoid concentrating aid in some places while leaving others out. Checks and balances also emerged to control theft and the use of goods made for vulnerable people for private gain. Other internal control mechanisms include audits boosting practical resource utilization. Charity-monitoring organizations are crucial in eradicating fraud and providing donors with information about humanitarians to control charity fraud. Several extrusive world-level oversight organizations attempted to enlighten and shield the public from charity fraud. However, these organizations are inconvenienced by the fact that charities depend on donors' empathy, which is instinct-generated.

4.3. Regression analysis results

The research used regression analysis to establish the linear statistical relationship between this study's independent and dependent variables. As stated in this study, the hypothesis was tested using regression models.

Test of Hypothesis 1: Supply Chain Efficiency and Performance of Humanitarian Aid Organizations in Kenya

A correlation analysis for the construct supply chain efficiency was conducted to establish how supply chain efficiency correlated with the performance of humanitarian aid organizations. Table 3 shows that the Pearson correlation coefficient was 0.661. These findings indicate the presence of a strong positive linear relationship between supply chain efficiency and the performance of humanitarian aid organizations.

Table 3: Correlation analysis for construct supply chain efficiency

Variable		Performance of HAOs	Supply Chain Efficiency
Performance of HAOs	Pearson Correlation	1	.661*
	Sig. (2-tailed)		.000
	N	290	290
Supply Chain Efficiency	Pearson Correlation	.661**	1
	Sig. (2-tailed)	.000	
	N	290	290

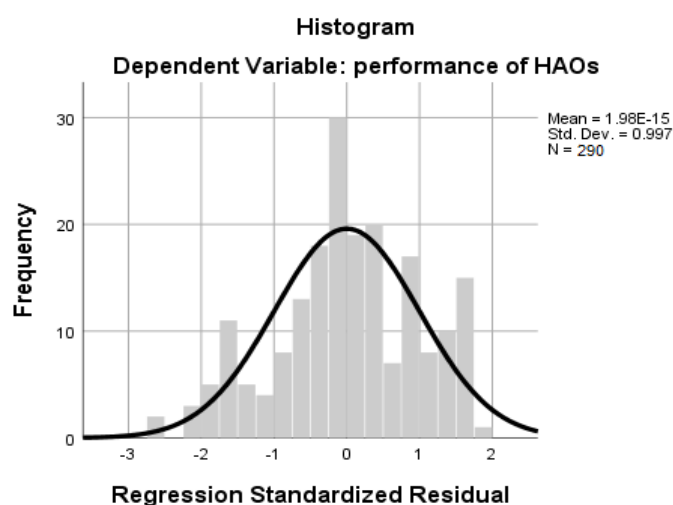
**. Correlation is significant at the 0.01 level (2-tailed).

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

Regression analysis was conducted to determine the influence of supply chain efficiency on the performance of humanitarian aid organizations. The hypothesis to test for this specific objective was:

H₀₁: Supply chain efficiency 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 model's fit to the i^{th} observation y_i and is used to explain the adequacy of the fitted model. According to Wogi, Wakweya, and Tesfay (2018), residual analysis is frequently helpful in checking the assumption that errors are normally distributed with constant variance and determining whether additional terms in the model would be helpful.

Figure 2: Histogram of supply chain efficiency on performance of humanitarian aid organizations

Presented in Table 4 is the model summary of the regression of supply chain efficiency on the performance of humanitarian aid organizations. The results show $R^2=0.436$, meaning that about 43.6 percent of the total variation in the performance of humanitarian aid organizations in Kenya can be attributed to supply chain efficiency.

Table 4: Model summary of supply chain efficiency

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

a. Predictors: (Constant), Supply Chain Efficiency

b. Dependent Variable: Performance of Humanitarian Aid Organizations

Further testing on the ANOVA shows that the regression model involving the performance of humanitarian aid organizations as the dependent variable and supply chain efficiency as the predictor is very significant at a 5% level of significance (F-statistic=223.528, $p<0.05$), as indicated in Table 5. This

implies that supply chain efficiency significantly influences the performance of humanitarian aid organizations in Kenya.

Table 5: ANOVA of supply chain efficiency

	Model	Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	78.436	1	78.436	223.528	.000c
	Residual	101.084	288	.3509		
	Total	179.520	289			

a. Dependent Variable: Performance of Humanitarian Aid Organizations

b. Predictors: (Constant), Supply Chain Efficiency

Further, Table 6 presents the coefficients and t-statistic of the resulting model. The constant term $\beta_0 = 4.490$, implies that if supply chain efficiency is kept constant, then there will be a positive performance of humanitarian aid organizations in Kenya by 4.490. The regression coefficient for supply chain efficiency was positive and significant at a 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 supply chain efficiency, the performance of humanitarian aid organizations is predicted to increase by 0.547 units.

Table 6: Coefficients of supply chain efficiency

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

a. Dependent Variable: Performance of Humanitarian Aid Organizations

Performance of Humanitarian Aid Organizations = 4.490 + 0.547 Supply Chain Efficiency

From the results in Table 3 to Table 6 above, the null hypothesis that supply chain efficiency does not significantly influence the performance of humanitarian aid organizations in Kenya is rejected. This result revealed that supply chain efficiency contributes positively to the performance of humanitarian aid organizations in Kenya. The findings of this study align with Balle, Jones, Chaize, and Fiume (2017), who state that for organizational effectiveness and to gain a competitive cost advantage, the organization must eliminate waste. In general, waste is the failure to add value for the beneficiary or is a barrier to adding. The humanitarians deal with unknown or ever-changing actors and uncertain supply and demand. The findings also confirm the argument by Larson and Foropon (2018) that humanitarian operations generally face high uncertainty, changing priorities and requirements, unstable supply chains, and a combination of sudden demand surges with the supply of unordered (material) donations of limited-use. This adds up to creating a challenging environment for process management, thus creating difficulties in waste elimination.

Supply chain efficiency plays a crucial role in enhancing the performance of humanitarian aid organizations in Kenya, where the effective delivery of assistance can significantly impact communities in need. Efficient supply chain management ensures that resources such as food, medicine, and equipment are delivered promptly and in the right quantities, minimizing delays and reducing waste. Humanitarian organizations can achieve more effective and responsive operations by streamlining logistics, improving inventory management, and fostering stronger relationships with suppliers and partners. An efficient supply chain becomes even more vital in Kenya, where infrastructure challenges and unpredictable conditions often complicate aid delivery. Organizations can improve decision-making and anticipate challenges before they escalate by leveraging modern technologies such as data analytics, real-time tracking, and automation. These tools enable faster responses to crises and enhance the allocation of resources, ensuring that aid reaches the most vulnerable populations on time. Moreover, organizational characteristics, such as leadership, culture, and internal processes, can further influence the impact of supply chain efficiency. Organizations with strong leadership and clear communication channels are better equipped to align supply chain strategies with their mission while fostering a culture of collaboration and continuous improvement. By addressing these internal factors and focusing on

supply chain optimization, humanitarian aid organizations in Kenya can significantly enhance their overall performance, providing timely and practical support to those in need.

The Moderating Effect of Organizational Characteristics on the Relationship Between Supply Chain Efficiency and Performance of Humanitarian Aid Organizations in Kenya.

To test the moderating effect of organizational characteristics on the relationship between supply chain efficiency and the performance of humanitarian aid organizations in Kenya, the study built in the following three models;

Models:

$$\text{Model 1: } Y = \beta_0 + \beta_1 X_1 + \varepsilon$$

$$\text{Model 2: } Y = \beta_0 + \beta_1 X_1 + \beta_z Z + \varepsilon$$

$$\text{Model 3: } Y = \beta_0 + \beta_1 X_1 + \beta_z Z + \beta_{1z} X_1 * Z + \varepsilon$$

Upon regressing the variables and as shown in Table 7, the Coefficient of Determination (R^2) for the first model was 0.436, meaning that supply chain efficiency, on its own, contributes 43.6% to the performance of humanitarian aid organizations in Kenya. Nevertheless, when organizational characteristics were introduced, the relationship between supply chain efficiency and the performance of humanitarian aid organizations in Kenya changed significantly. Table 7 indicates that the R^2 before the introduction of organizational characteristics was 0.436 (43.6%), which changed significantly to 0.665 (66.5%) upon the introduction of organization characteristics, implying a 0.229 (22.9%) increase. This meant that supply chain efficiency and organization characteristics could explain up to 66.5% of the performance of humanitarian aid organizations in Kenya. Upon adding the interaction term $X_1 * Z$, the model was improved to R^2 of 0.673, an increase of 0.011. In a nutshell, the R^2 increased by 22.9 percent when the organizational characteristics were considered in addition to the supply chain efficiency and increased by 1.1% when the interaction between the moderator and the supply chain efficiency was considered.

The results implied that organizational characteristics as a predictor add value to the model and moderate the relationship between supply chain efficiency (X_1) and the performance of humanitarian aid organizations in Kenya (Y).

Table 7: The moderating effect of organizational characteristics on the relationship between supply chain efficiency and performance of humanitarian aid organizations in Kenya

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change
1	.661a	.436	.427	.78413	.436
2	.815b	.665	.661	.33421	.229
3	.822c	.676	.673	.32834	.011

a. Predictors: (Constant), Supply Chain Efficiency

b. Predictors: (Constant), Supply Chain Efficiency, Organizational Characteristics

c. Predictors: (Constant), Supply Chain Efficiency, Organizational Characteristics, the interaction between supply chain efficiency and organizational characteristics

d. Dependent Variable: Performance of Humanitarian Aid Organizations

Table 8 shows the ANOVA results for the models considered in testing for the moderating effect of organizational characteristics on the relationship between supply chain efficiency and the performance of humanitarian aid organizations in Kenya. The results, Model 1 (F-statistics=223.528, $p < 0.05$), Model 2 (F-statistics=285.603, $p < 0.05$), and Model 3 (F-statistics=196.449, $p < 0.05$), indicate that all the three models remained significant despite the use of the different predictors.

Table 8: ANOVA for the Models Used to Test for the Moderating Effect

	Model	Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	78.436	1	78.436	223.528	.000b
	Residual	101.084	288	.3509		
	Total	179.520	289			
2	Regression	119.381	2	59.691	285.603	.000c
	Residual	60.139	287	.209		
	Total	179.520	289			
3	Regression	120.817	3	40.272	196.449	.000d
	Residual	58.703	286	.205		
	Total	179.520	289			

a. Dependent Variable: Performance of Humanitarian Aid Organizations

Table 9 presents the regression coefficients, the t-test- statistic, and the significance of the coefficients obtained from the three models used to investigate whether organizational characteristics moderate the relationship between supply chain efficiency and the performance of humanitarian aid organizations in Kenya. The result indicates that when supply chain efficiency considered in this study was used in multiple linear regression, the constant term $\beta_0 = 4.490$, implies that if supply chain efficiency is held constant, there will be a positive performance of humanitarian aid organizations in Kenya by 4.490. The regression coefficient for supply chain efficiency was positive and significant ($\beta_1 = 0.547$, $p < 0.05$), with a t-value of 5.965. This implies that for every unit increase in supply chain efficiency, the performance of humanitarian aid organizations is predicted to increase by 0.547 units.

When the moderator is included, the results of model 2 show that supply chain efficiency ($\beta = 0.623$, $p < 0.05$) and the moderator organizational characteristics ($\beta = 0.312$, $p < 0.05$) have a significant positive influence on the performance of humanitarian aid organizations. Model 3 investigated the interaction effect between the supply chain efficiency and the moderator (organizational characteristics). The result indicated a significant positive influence on the performance of humanitarian aid organizations from the interaction between organizational characteristics and supply chain efficiency ($\beta = 0.345$, $t = 3.165$, $p < 0.05$).

Table 9: Coefficients for the models used to test for moderating effect

	Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	4.490	.376		11.949	.000
	Supply Chain Efficiency	.547	.092	.661	5.965	.000
2	(Constant)	1.645	.235		7.000	.000
	Supply Chain Efficiency	.623	.105	.645	5.933	.000
	Organizational Characteristics	.312	.108	.395	2.888	.000
	(Constant)	1.093	.153		7.144	.001
3	Supply Chain Efficiency	.644	.234	.651	2.752	.000
	Organizational Characteristics	.214	.041	.236	5.220	.000
	Supply Chain Efficiency *	.345	.109	.405	3.165	.000
	Organization Characteristics					

a. Dependent Variable: Performance of Humanitarian Aid Organizations

Thus, the regression models after moderation become:

Model 1: $Y = 4.490 + 0.547X_1$

Model 2: $Y = 1.645 + 0.623X_1 + 0.312Z$

Model 3: $Y = 1.093 + 0.644X_1 + 0.214Z + 0.345X_1Z$

The study hypothesized that organizational characteristics do not moderate the relationship between supply chain efficiency and the performance of humanitarian aid organizations in Kenya. The rule of thumb is that if there is a significant influence on the dependent variable from the interaction between the moderator and independent variable, moderation is supported; otherwise, moderation is not supported. From the results in Table 7 to Table 9, the null hypothesis is rejected. The study concludes that Organizational characteristics such as firm size, age, and structure significantly moderate the relationship between supply chain efficiency and the performance of humanitarian aid organizations in

Kenya. These factors influence how effectively supply chain processes are managed and how they contribute to organizational performance. Firm size can impact the ability of an organization to optimize its supply chain. Larger humanitarian aid organizations typically have more resources, better access to technology, and established networks, allowing them to implement more efficient supply chain practices. These organizations can leverage economies of scale, leading to lower operational costs and better coordination across various supply chain functions. However, larger organizations may also face challenges related to bureaucracy and complex decision-making processes, which can slow down supply chain responsiveness in times of crisis. On the other hand, smaller organizations may benefit from greater flexibility and quicker decision-making but may struggle with resource constraints, limiting their ability to achieve supply chain efficiency.

Organizational age also plays a role in how supply chain efficiency influences performance. Older organizations often have more established processes and a deeper understanding of the logistical challenges specific to their operational environment. Their experience can help them adapt more quickly to changing conditions. However, older organizations may also be less willing to adopt new technologies or methodologies, which could hinder the optimization of supply chain operations. Younger organizations, while potentially more innovative, may lack the experience and established networks necessary to manage a highly efficient supply chain, which could impact their performance during emergencies.

The organizational structure further moderates this relationship. A decentralized structure allows for more agile decision-making and faster responses to supply chain disruptions, whereas a centralized structure may streamline operations but limit flexibility. The extent to which an organization's structure supports quick decision-making and effective coordination is crucial in determining how well supply chain efficiency translates into improved performance. In conclusion, the interaction between supply chain efficiency and organizational characteristics, firm size, age, and structure shapes the overall performance of humanitarian aid organizations in Kenya. Tailoring supply chain strategies to an organization's specific needs based on these characteristics can significantly enhance its operational effectiveness.

5. Conclusion

The study found that supply chain efficiency directly enhances the performance of humanitarian aid organizations by ensuring timely delivery of aid, reducing costs, and improving resource allocation. Organizations with streamlined logistics and optimized inventory management are able to respond more effectively to crises, thereby increasing their impact on communities in need. Additionally, efficient supply chain processes contribute to better coordination with suppliers and partners, enhancing organizational performance and operational effectiveness. Secondly, the study revealed that organizational characteristics, such as firm size, age, and structure, significantly influence how supply chain efficiency affects the performance of humanitarian aid organizations in Kenya. Larger organizations, with more resources and established networks, can leverage their size to optimize supply chain operations, while smaller ones benefit from greater flexibility.

Additionally, the organizational age and structure, whether centralized or decentralized, determine how well these organizations adapt to supply chain challenges, either enhancing or limiting the effectiveness of their operations. Waste management is a continuous exercise in humanitarian supply chains involving identifying and eliminating non-value-adding activities in the supply chains. Minimization of waste enhances resource utilization in organizations. Most organizations have managed to eliminate the non-value-adding operations in their supply chains, but some humanitarian aid organizations have yet to do so. One of the significant 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.

Forms of waste in humanitarian supply chains emerging from the findings of this study included corruption and diversion of funds. High diversion rates of funds decrease the range of support for those who need it while creating interest for unknown groups of people who were never meant to be the beneficiaries. This affects the value, nature, and necessity of the assistance. Concisely, disasters and pandemics provide a smokescreen for dubious transactions for personal benefit with little or no scrutiny. This explains the increase in money-minting schemes by disasterpreneurs. Mechanisms of

addressing supply chain wastes in the disaster containment process included eliminating the import and tax charges. In addition, punishments were imposed on people who abused services, and annulments were made immediately with a binding clarification. Checks and balances also emerged to control theft and the use of goods made for vulnerable people for private gain. Other internal control mechanisms include audits boosting practical resource utilization. To control charity fraud, charity-monitoring organizations played a significant role in exterminating fraud and availing information to donors about humanitarians.

6. Recommendations of the study

This study recommends that donors increase their funding on humanitarian aid operations, but this benefit should come at a price, that donors demand to date with accounts of how their funding is used and to see assessable results. Donors should demand that humanitarian aid organizations obtain the necessary items efficiently and provide the goods to the beneficiaries, meeting the high-quality requirements effectively, efficiently, and speedily. Donors should also demand accountability of humanitarian aid organizations. Humanitarian aid organizations should also invest in modern supply chain technologies like data analytics, inventory management systems, and real-time tracking tools. These innovations will help streamline operations, reduce delays, and deliver timely aid.

The study findings indicate that the size of an organization and experience obtained from existing longer in humanitarian and disaster relief places big and older firms at an operational and maneuverability advantage compared to their counterparts in disaster response. This study recommends the creation of an enabling environment for the small and local humanitarian organizations topped up with adequate financing, as this cadre of humanitarian aid organizations has the advantage of better domestic know-how and familiarity with the distressed populations and localities. Subsequently, the study findings indicated that the weakness of organizational structure adversely affects the organization's performance despite the supply chain design adopted, leading to slackened humanitarian services. This is because the organization's structure governs the rate of decision-making and the flow of information in and outside an organization. The study recommends that humanitarian aid organizations adopt flexible, less complex, and fully centralized organizational structures in disaster management for prompt response to save lives and property. This is upon the realization that organization structure is a crucial factor in swift, on-time disaster response, and any weakness in organization structure inhibits practical, well-organized, and well-timed emergency response. Moreover, humanitarian aid organizations should evaluate their organizational structure to ensure it supports efficient supply chain operations. A decentralized structure may be beneficial for quick decision-making, while a centralized structure should be streamlined to maintain flexibility and responsiveness in crises.

Further, organizations of varying sizes should adapt their supply chain strategies to their resources. Larger organizations should focus on enhancing coordination and reducing bureaucracy, while smaller organizations can prioritize agility and flexibility to respond quickly to crises. Older organizations should capitalize on their experience and established networks to enhance supply chain efficiency. They should also consider adopting newer technologies and methodologies to avoid stagnation. Conversely, younger organizations should seek mentorship and build relationships to strengthen their supply chain capabilities. Regular training programs for staff on supply chain best practices and technological tools can improve efficiency, aligning human resources with operational goals.

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Conflicts of interest

The author declares no conflict of interest.

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