Contribution of Logistics Cooperation to Effective Disaster Relief Operations in Addressing Pandemics in Tanzania

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ABSTRACT

The research aimed to identify the crucial aspects of humanitarian organizations that can improve the effectiveness of disaster relief operations. The study involved 150 participants from Tanzanian humanitarian organizations and used a combination of quantitative and qualitative methods, including questionnaires and interviews. The researchers employed multiple regressions to examine the relationship between independent and dependent variables. The findings indicated that coordination among stakeholders and vertical logistics cooperation can enhance the effectiveness of disaster relief operations. The study concluded that the efficiency of humanitarian logistics is crucial for disaster relief operations and recommended that the government prioritize public-private partnerships, develop reliable infrastructure, and empower logistics service providers and humanitarian organizations. The study could guide policymakers in developing frameworks to improve cooperation among stakeholders and logistics systems in disaster relief operations. Additionally, it adds to the existing knowledge on stakeholder theory and strengthening the humanitarian logistics systems.

Keywords: Logistics Cooperation and Humanitarian Organizations, Disaster Relief Operations, Pandemics, Humanitarian Logistics

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I. INTRODUCTION

The occurrence of both natural and man-made pandemics has disrupted logistics operations worldwide. As a result, humanitarian logistics is necessary to facilitate the transportation of goods and people to affected areas and provide essential supplies such as food, medical equipment, and medicine (United Nations Coordinated Appeal, 2020). Logistics activities in major cities in China have been severely impacted; prompting the government to implement measures to facilitate the movement of goods. However, due to a lack of preparedness, there were no strategies in place to address the logistical challenges in a disaster environment (Wuhan Statistics Bureau, 2019). The spreading of corona virus into the United States, Asia and European countries have affected almost 70% percentage of the supply chain, which is more pronounced as in the movement of people, raw materials, finished goods and merchandisable materials (Zoumpourlis et al., 2020).

According to the Financial Report on Disaster Response in Russia from 2015, the country faces challenges in establishing a suitable environment, including logistics, to facilitate efficient disaster operations. The issues raised in the report include the logistical difficulties in transportation of relief items, distribution of non-food relief items and hygiene supplies that constrained by ineffective coordination of the stakeholders, not recognizing the important aspect for improving performance of Humanitarian logistics and involvement of logistic service providers. The report illustrate that it is crucial to have systems that ensure effective coordination and distribution of supplies to the effected population during pandemic or during a disaster, as this will pave ways to also proper rescue and control to the disaster in question.

Karanja, Muirura, and Ombui (2015) reported that in Kenya, the effectiveness of disaster relief operations during pandemics or other disasters depends on the efficient functioning of humanitarian logistics. They highlighted several areas that require improvement in practice, including humanitarian logistics coordination, which is a challenge for Kenyan humanitarian organizations and stakeholders. Mweiga (2013) also emphasized the importance of involving logistics service providers. The 2009 Kenya National Disaster Response Plan, formulated jointly by the Office of the President Ministry of State for Special Programmes (MSSP) and the Ministry of Provincial Administration and Internal Security-National Disaster Operation Centre (NDOC), highlighted that poor coordination is a significant obstacle during natural disasters, leading to inefficiencies in providing relief assistance. According to Kassema (2020), African governments face challenges in providing adequate resources to support populations affected by disasters due to limited national resources. For instance, in the Democratic Republic of Congo (DRC), committees were formed to manage COVID-19 and Ebola outbreaks in the hope of coordinating resources with other stakeholders, but this was

not successful (Nachega et al., 2020). This problem is also evident in Tanzania, where there is a lack of facilities and mechanisms for managing and responding to disasters (Stephano, 2018). To address these issues and ensure that countries have effective disaster management systems, humanitarian relief organizations need to recognize the importance of humanitarian logistics during pandemics and related disasters (Saleh & Karia, 2020).

Most of the companies for example, have coordinated efforts with health-care organizations, the trading partners, and hospitals and with governments to ensure proper flows of materials. The companies have so far played crucial roles to address the logistical challenges (Besiou, Stapleton, &Wassenhove, 2011). This played crucial role in provision of supplies but faces challenges also due to boundary restrictions and lockdowns. Instituting better strategies to the implementation of humanitarian logistics philosophies and logistical operations for epidemic control (Dasaklis, Costas & Nikolaos, 2012) would alleviate these situations. This will ensure better flows and storage of supplies and the attached data, from the point of supply or manufacturing to the point of ultimate use for the purpose of alleviating the suffering.

The recent COVID 19 pandemic demonstrates that problem is not only limited to resources facing developing countries; it calls for knowledge to humanitarian logistics in enhancing collaboration of key player (Babatunde, Oloruntoba & Agho, 2020).Understanding the unique features and characteristics and issues relating to import and export procedures which could play crucial roles in enhancing the performance of humanitarian logistics (Heaslip, Haavisto & Kovács, 2018). As a number of national organization and the international organizations are interested to take part in global crisis, their coordination as on the matter pose major obstacles and constraints which may have a serious impact to those areas in need in disaster or in pandemic crisis (Nandi, 2022). The difficulties are more pronounced as inadequate logistics infrastructure and inappropriate means towards coordination and cooperation (Schulz and Blecken, 2010). All these calls for proper mechanisms in sourcing, procurement, deliveries, storage and physical distribution of the items required on these situations as medical product, foods supplies and the sort for Africa and most of the developed countries humanitarian emergencies (Heaslip et al., 2018).

1.1 Statement of the Problem

The global outbreak of pandemics has underscored the significance of humanitarian logistics in ensuring the continuous supply of resources to affected communities (Save the Children, 2015; Wolicki et al., 2016). In the event of traditional logistics being inadequate to absorb shocks and maintain the flow of goods and services, humanitarian logistics plays a critical role in disaster relief efforts (Eriksson & Karlsson, 2017). Nevertheless, developing nations like Tanzania face challenges in effectively managing humanitarian logistics due to limited knowledge on logistics partnerships and cooperation (Schiffling et al., 2020).

Efforts have been made to enhance humanitarian logistics practices, but more needs to be done to guarantee the effectiveness of disaster relief efforts. For instance, hiring specialized personnel for specific disasters and implementing proper coordination and proactive measures are crucial for successful disaster relief operations, as noted by Mpanju (2015). Despite numerous studies emphasizing the importance of humanitarian logistics in disaster relief efforts, few have specifically focused on pandemics (Vaillancourt, 2015). Moreover, research on logistics cooperation and partnerships in disaster relief efforts is limited in Tanzania. Existing literature highlights the difficulties in humanitarian logistics and underscores the need for stakeholders' involvement to transform challenges into key performance indicators, including coordination and cooperation between stakeholders (Kovacs & Spens, 2009; Kassema, 2020; Saleh & Noorliza, 2020; Kessa, Sadiq, & Yeo, 2021). Horizontal and vertical cooperation are critical components of effective humanitarian logistics.

This study aimed to address the research question, which seeks to establish the necessary logistical coordination required to achieve effective disaster relief operations during pandemics in Tanzania. It aims to determine whether logistics cooperation has a positive impact on the effectiveness of disaster relief operations in addressing pandemics in Tanzania.

II. LITERATURE REVIEW

2.1 Theoretical Review

The paper was founded on the grounding stakeholder theory. According to Ademola and Adebayo (2014), stakeholders refer to individuals or groups who have an interest in an organization or business and who can impact or be impacted by the organization's activities. The stakeholder theory posits that disasters can affect all stakeholders and their daily operations, resulting in supply shortages and price fluctuations (Freeman, 2010; Gunasekaran et al., 2018). Companies providing supplies to disaster-affected areas rely on downstream logistics and supply chains, while disaster

victims depend on relief organizations and agencies (Carter, 2015; Pfeffer & Salancik, 1978, 2003). The coordination and behavior of stakeholders are crucial for the success of relief operations.

To address these challenges, it is crucial to establish partnerships between stakeholders involved in disaster relief operations and humanitarian logistics. Such partnerships would enable a coordinated effort and pooling of resources for rescue operations. Private and public stakeholders can participate in disaster and humanitarian operations in different ways, and communication and joint planning are essential for effective relief efforts.

Corporate sector stakeholders need to be aware of the impact of disasters on their operations and supply chains and can indirectly contribute to disaster and humanitarian relief efforts through contractual engagements. Organizations can also support economic development in conflict or post-disaster zones and contribute to the employment of impacted populations with the aid of the international aid network and local government (Bray & Crockett, 2012). Making products and services available to the general public can facilitate long-term disaster and humanitarian response and recovery (Nkamnebe & Idemobi, 2011; Yates & Paquette, 2011).

2.2 Empirical Review

Logistic operations encompass several functions, including procurement, demand management, customer service, and customer relations, to meet customer needs effectively (Casado-Vara et al., 2018; Douglas & Lambert, 2000). In the domain of humanitarian logistics, research has been conducted to assess its performance. According to Beamon & Balcik (2008) and Roh et al. (2018), the location of the warehouse plays a critical role in the successful implementation of humanitarian logistics. The supply chain for humanitarian logistics supports the primary warehouse's supply chain, usually located near an airport or port. The goods are stored in a permanent warehouse located closer to the city, where storage, sorting, and shipping activities are carried out before the next step. This permanent warehouse serves as a hub for humanitarian logistics, from where inventories are dispatched to smaller tertiary warehouses before reaching their intended recipients. Unlike the distribution of products for commercial purposes, which has a short supply chain, the supply chain process in humanitarian logistics is longer, resulting in lower customer service levels. The occurrence of both natural and human-made disasters has had a significant impact on logistics operations globally, necessitating the need for humanitarian logistics to facilitate the movement of goods and people, providing essential supplies such as food, medical equipment, and medicines to affected areas and populations (United Nations Coordinated Appeal, 2020). In China, major business cities have experienced significant disruptions in their logistics activities, prompting the government to implement measures to facilitate the movement of goods. However, due to a lack of preparedness, there was a lack of strategies to address logistics operations in the disaster environment (Wuhan Statistics Bureau, 2019).The spreading of corona virus into the United States, Asia and European countries have affected almost 70% percentage of the supply chain, which is more pronounced as in the movement of people, raw materials, finished goods and merchandisable materials (Seric et al., 2020). This has also caused the hindrance in the movement of pandemic control items and caused a scarcity of consumer goods, these problems efficiency in preparing supply chains against the stated disturbances (Kumar & Sharma, 2021).

According to Disaster Response Financial Report of Russia (2015), the country also struggles to create good environment or the logistical environment to ensure the effectiveness in disaster operations. The issues raised in the report include the logistical difficulties in transportation of relief items, distribution of non-food relief items and hygiene supplies that constrained by ineffective coordination of the stakeholders, not recognizing the important aspect for improving performance of Humanitarian logistics and involvement of logistic service providers.

According to a study by Karanja, Muirura, and Ombui (2015), in Kenya, effective disaster relief operations rely on well-functioning humanitarian logistics. However, there are several issues that need to be addressed to improve practice, including humanitarian logistics coordination and involvement of logistics service providers. The lack of coordination during natural disasters was also identified as a problem in the Kenya National Disaster Response Plan published by the Office of the President Ministry of State for Special Programmes (MSSP) and Ministry of Provincial Administration and Internal Security -National Disaster Operation Centre (NDOC) in 2009. African governments have limited resources to aid populations during disasters, which poses a challenge to their ability to cope (Kassema, 2020). For instance, in the Democratic Republic of Congo (DRC), committees were formed to manage the Covid-19 and Ebola outbreaks but coordination with other stakeholders was unsuccessful (Nachega et al., 2020). Similarly, the Kenya National Disaster Response Plan and the disaster management mechanisms in Tanzania have also faced challenges (Stephano, 2018). To address these issues and improve disaster management, there is a need for humanitarian relief organizations to recognize the importance of humanitarian logistics in pandemic situations and related disasters (Saleh & Karia, 2020).

Cognizant of man-made and natural disasters occurring more frequently, the humanitarian aids organization strives to save the lives of disaster affected people throughout the world (Fritz Institute, 2005; EM-DAT, 2008). In this

regard, humanitarian logistics plays a crucial role in the distribution processes among the field officers, the local institutions, and affected people. Logistics activities are also a vital component in humanitarian assistance and humanitarian operations, to the extent that almost 80% of disaster relief operations are accounted for by logistics efforts (Overstreet *et al*., 2011).

Companies in most countries have joined forces and some should think of this a strategy to improve the humanitarian logistics (European Union, 2019). Considering the logistical issues to ensuring the proper flow of the goods in disaster situations and ensuring that there is preparedness the companies need to recognize the importance of coordination (Moeiny & Mokhlesi, 2011). Most of the companies for example, have coordinated efforts with health-care organizations, the trading partners, and hospitals and with governments to ensure proper flows of materials. The companies have for far played crucial roles to address the logistical challenges (Besiou, Stapleton and Wassenhove, 2011). This played crucial role in provision of supplies but faces challenges also due to boundary restrictions and lockdowns. Instituting better strategies to the implementation of humanitarian logistics philosophies and logistical operations for epidemic control (Dasaklis, Costas and Nikolaos, 2012) would alleviate these situations. This will ensure better flows and storage of supplies and the attached data, from the point of supply or manufacturing to the point of ultimate use for the purpose of alleviating the suffering.

III. METHODOLOGY

3.1 Research Design

The study utilized a sequential explanatory research design to create concepts from the collected data, interpret the data, and explain how cooperation in humanitarian logistics can enhance disaster relief operations during pandemics in Tanzania.

3.2 Population and Sample Size

The target population consisted of stakeholders involved in the success of humanitarian logistics and disaster relief operations, including humanitarian organizations. The study observed five organizations, and the respondents were individuals who participated in humanitarian logistics and disaster relief operations. The sample size comprised 150 respondents, which was determined using Cochran's Sample Size Formula. Stratified random sampling was employed to select random samples from groups with comparable characteristics within the population.

Formula for calculating sample of unknown population (Cochran's Sample Size Formula) was applied:

$$n = \frac{Z^2}{4d^2}$$

n= sample size, z= the value on the z table at 95% confidence level = 1.96, d=sampling error at 8%

3.3 Research Instruments

The study employed is survey questionnaire and guided interviews tools of data collection tools, this were employed to enable the researcher to have adequate quantitative data for triangulation of information. The study involved data collection process through questionnaire to all respondents, interview schedule conducted with few selected humanitarian logistics and disaster relief experts.

3.4 Validity and Reliability

3.4.1 Validity

Validity refers to the degree to which a test or research instrument accurately measures what it is intended to measure. It is concerned with the accuracy and meaningfulness of the inferences made from the data collected (Blumberg, Cooper, & Schindler, 2005), and the ability of the research instrument to measure what it purports to measure (Babbie, 2010). The content validity of the data collection instrument used in this study was established by consulting with research experts at the university, who provided valuable feedback, corrections, and suggestions that assisted in validating the research instrument.

To ensure validity, a pilot test study was conducted on a sample of 10 randomly selected respondents to check the accuracy of the questionnaire and interview guide before administering them for full data collection. Additionally, the researcher sought the opinions of various experts in the field of humanitarian logistics and disaster relief operations. These experts reviewed the tools and provided feedback on the questions and themes contained within them. The inputs from the experts were incorporated into the tools to ensure that the researcher collected relevant and adequate data to achieve the study objectives.

3.4.2 Reliability

To ensure that the research instrument can measure accurately with consistent results, reliability is necessary. The researcher conducted a pilot study to test different sections of the questionnaire and measured reliability using the Cronbach's alpha coefficient, which is commonly used to estimate internal consistency by determining the relationship between all items on a test and the total test. In this study, all five variables had a Cronbach's alpha coefficient above 0.7, which is the acceptable limit for acceptance, according to Burns *et al* (2012). Therefore, the questionnaires were reliable, as indicated by Cronbach (1951) and Saunders et al. (2012).

Table 1

Data reliability: Cronbach's Alpha

Construct/variable	Construct items	(α)
Contribution	C1, EC2, C3, C4, C5,C6,C7	0.908

These findings indicate that the test is of good quality based on Cronbach's Alpha, as it falls within the acceptable range of $0.8 > \alpha \geq 0.7$, is considered good when $0.9 > \alpha \geq 0.8$, and excellent when $\alpha \geq 0.9$, in terms of internal consistency.

3.3 Data Analysis

The data were analyzed using multiple linear regression analysis and descriptive analysis with the aid of Statistical Package for the Social Sciences (SPSS). These involved examining data and information in numerical and non-numerical methods. Mean and standard deviation were used in descriptive analysis and R and R^2 and t-tests and coefficients were used in regression.

Table 2

Measurement of variables

Variable	Definition	Measurement	Instrument
Logistics cooperation	-Vertical cooperation (effective communication, logistical costs sharing, joint operations, resource mobilization, sharing of information and resources) -Horizontal cooperation (effective communication, logistical costs sharing, joint operations, resource mobilization, sharing of information and resources)	5-point Likert scale	Questionnaires and interview guide

Source: Researcher's own construction (2021).

3.4 The Test of Model Assumptions

3.4.1 Test of Multicollinearity

In order to examine presence of multicollinearity, this research study employed Variance Inflation Factor (VIF), which identifies level of correlation between predictor variables (Gunst et al., 2019). Multicollinearity is not a concern if the VIF score is between 1 and 10 (Mertler & Reihnhart, 2016). However, if the VIF score is less than 1 or greater than 10, multicollinearity is present (Mertler & Reihnhart, 2016). Based on the findings presented in Table 3, this study is devoid of multicollinearity issues, as the VIF scores range between 1 and 2.

Table 3

Multicollinearity Statistics

Variables	Tolerance	VIF
Logistics cooperation	0.7463	1.340

3.4.2 Heteroscedasticity

The ordinary least squares (OLS) linear regression assumes that the residuals' variance from the model is constant and independent of the independent variables (homoscedasticity) (Mertler & Reinhart, 2016). If this assumption is not met, it results in heteroscedasticity, which reduces the accuracy of the coefficient estimates and

increases the chances of imprecise representation of the population. To test for heteroscedasticity, Levene's Test was used. The test determines homoscedasticity when the p-value is greater than 0.05 (p>0.05) (Mertler & Reinhart, 2016). In this study, the variables exhibited homogeneity with a p-value of 0.767, indicating p>0.05, and thus homoscedasticity.

Table 4
Heteroscedasticity test

Levene's Statistic	df1	df2	Sig.
0.089	0	150	0.767

3.4.3 Normality

This study employed two statistical tests, Kolmogorov and Shapiro-Wilk, to assess the normality of the collected data. The results of the tests are presented in Table 5. The outcomes indicate that the p-values for both tests are greater than 0.05, indicating that the collected data were normally distributed.

Table 5
Normality Test Results of Kolmogorov and Shapiro-Wilk Test

Variables	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Logistics cooperation	0.129	150	0.016	0.989	150	0.158

IV. FINDINGS & DISCUSSION

4.1 Working experience of the Respondents

The aim of the study was to gain insight into the work experience of the participants as a means of understanding their background information. This information was helpful in establishing that the participants were familiar with relief operation procedures and the workings of humanitarian organizations, as well as their experiences related to logistics and how it connects to humanitarian operations. To categorize the duration of work experience, the study divided it into three groups: those with less than one year of experience, those with 6 to 10 years of experience, and those with over 10 years of experience. The findings of the study are presented in Table 6.

Table 6
Working experience of the Respondents

Categories of working experience	Frequency	Percentage
Less than 5 years	31	20.6
Between 6 to 10 years	55	36.7
Above 10 years	64	42.7
Total	**150**	**100**

The results presented in Table 6 indicate that a majority of the respondents, accounting for 64 individuals (42.7%), possess substantial experience of over 10 years in humanitarian and disaster relief operations. This suggests that the respondents have adequate knowledge about their operations. These findings indicate that the respondents have a strong background in working with humanitarian organizations, and possess experience in supply chain and disaster relief operations. Additionally, the respondents appear to be well-versed in the standard procedures and workings of disaster relief operations. These findings are consistent with those of Abebe (2012), who similarly found that roughly 73% of the respondents possessed more than 10 years of working experience, and were therefore capable of providing accurate and reliable information regarding practices.

4.2 The Contribution of Logistics Cooperation to effective Disaster Relief Operations in Addressing Pandemics in Tanzania

The Likert scale was used to collect data from respondents, who were asked to indicate their level of agreement or disagreement with various statements on a scale of 1 to 5. The scale ranged from '1' for strongly disagree

to '5' for strongly agree, with '2' and '3' representing disagree and neutrality, respectively. The study assigned a mean score of 1.0 to 2.5 for the responses 'strongly disagree' and 'disagree', which indicated disagreement, and a mean score of 3.5 to 5.0 for the responses 'agree' and 'strongly agree', which indicated agreement. The response 'neutral' was assigned a mean score of 2.6 to 3.4 to indicate neutrality.

Table 7

The contribution of Logistics Cooperation to effective Disaster Relief Operations in Addressing Pandemics in Tanzania

Statement	Mean	Std. Dev.
Cooperation between government and private health institutions may improve disaster relief operations	4.50	0.988
Cooperation between government and private health institutions may improve disaster relief operations	4.41	0.824
Cooperation between government and international relief organization may improve disaster relief operations	4.37	0.987
Cooperation between hospitals and manufacturer of medical equipment may improve disaster relief operations	4.86	1.456
Cooperation between transport service provider and manufacturer of medical equipment may improve disaster relief operations	4.33	0.863
Cooperation between transport service provider and private health institutions may improve disaster relief operations	4.30	0.827
Cooperation between government and transport service providers	4.33	0.863
Average	**4.44**	**0.973**

According to Table 8, the mean values are above 3.00, which indicate that the majority of the respondents agreed with the given statements regarding the contribution of logistics cooperation to effective disaster relief operations in addressing pandemics. This implies that they do not have a neutral opinion on the matter. Moreover, the standard deviations are less than one, which suggests that there is very little variability in the data set. Overall, the narrow range of values and the mean above 3.00 indicate agreement with the statement.

The range between the mean of 4.33 and 4.86, given the standard deviation, indicates that there is room for improvement in Logistics Cooperation for Disaster Relief Operations in Addressing Pandemics in Tanzania. One of the ways to improve this is by promoting cooperation and collaboration between transport service providers, government and private health institutions, government and international relief organizations, hospitals and manufacturers of medical equipment, transport service providers and manufacturers of medical equipment, service providers and private health institutions, as well as government and transport service providers. This finding suggests that disaster relief operations can be enhanced by encouraging stakeholders to work together and share resources to effectively control pandemics from a humanitarian logistics and disaster relief operations perspective.

This portray that Cooperation between government and private health institutions may improve disaster relief operations, Cooperation between government and international relief organization may improve disaster relief operations, Cooperation between transport service provider and manufacturer of medical equipment may improve disaster relief operations and Cooperation between government and transport service providers, that have mean more than 4 and standard deviation less than 1.00, contribute more to the effectiveness of disaster relief operations.

These sorts of cooperation could be pronounced in terms of the resources that are crucial in disaster relief operations, like the experts in humanitarian logistics and relief operations (the human resources), the funds that need to be used in the relief operations (capital for facilities and working capital in the operations) and the machinery and equipment that need to be used by the people in operations. The cooperation may also mean sharing of information and plans that are crucial is relief operations that may help in prediction and forecasting and preparation of the tools that are necessary in the process.

This findings are in line with that of Moktadir, Rahman, and Ali, (2017), they determined that critical factors to humanitarian logistics includes; Highly equipped infrastructure and transportation system, Coordination and collaboration with relief agencies, Proper risk assessment and planning, Enough qualified manpower and Continuous improvement in the alertness, preparedness, and high responsiveness, just to mention the few in their findings. This

also corresponds to the study by Sabri et al. (2019) indicated a lack of coordination among the agencies involved in the relief activities as the fundamental challenge in SHSCM. This challenge results in a lack of communication, poor technological infrastructure, lack of administrative personnel, lack of clear policies, ineffective distributing relief material, and stagnation of relief activities (Vega, 2018). Another critical challenge hampering the efficiency of SHSCM is a difficulty in fundraising (Turrini et al., 2020). This is to say collaboration, as in horizontal and vertical is recognized as the strategy to effective systems in disaster relief operations and this may improve operations and effectiveness in contribution and management of resources.

These results also corresponds to that of Maghsoudi and Moshtari (2021), engagement of humanitarian actors nationally and internationally determines the performance of humanitarian logistics and have crucial role in harmonizing pandemic situations and combining resources and experts helps in effective disaster relief operations. This is also supported by Besiou and Wassenhove (2019), that it is crucial to create engagement of different actors with vested interest in disaster relief operations nationally and internationally.

During interview, the respondents were asked about the issues of collaboration and coordination, the respondents narrated that cooperation is very important since it makes the organizations to join forces and resources and also in help in improving the systems and processes in disaster relief operations. I quoted one of the respondents saying that,

> *" if we want to really help the population during disasters and pandemic situations, we need to collaborate, collaboration will help to connect health facilities, logistics service providers, international agencies and the government which is good to ensure effectiveness in rescues and controlling the spread effect of diseases and negative effects of pandemic…"* (Field data interview, Kigoma, 17 July, 2021).

This means that horizontal and vertical cooperation is necessary in creating a favorable disaster relief environment. From the findings it clearly show that cooperation between the named stakeholders makes the system that enhance organizations to participate fully in rescues and controlling the spread effect of diseases and negative effects of pandemic. This is also supported by Eltantawy et al. (2015) that cooperation between stakeholders in disaster relief operation is crucial and it may take many forms, may mean cooperation between health institutions, government agencies, international agencies, humanitarian organizations and other government institutions.

4.2.1 Model analysis on The Contribution of Logistics Cooperation to effective Disaster Relief Operations

The study employed multiple linear regression analysis to examine if logistics cooperation had a considerable effect on the effectiveness of disaster relief operations. The research used three independent variables, which were vertical cooperation, horizontal cooperation, and another variable that was not specified. As the data collected for the study was based on the Likert scale, the study grouped the Likert-type items of the dependent variable together to produce a composite score/variable during the data analysis stage, providing a numerical measurement of a characteristic or trait.

The preliminary summary of the results from the multiple linear regression models indicates that the R-squared value was 0.981, while the adjusted R-squared value was 0.981. The coefficient of determination (R2 = 0.981) suggests that the three predictor variables examined in this objective can only explain 98% of the influence of logistics cooperation on the effectiveness of disaster relief operations, and there may be other variables that also affect the dependent variable but were not considered in this study.

Table 8

Coefficients

COEFFICIENTS					
Variables	**Unstd. Coefficients**		**Stand. Coefficients**		
	B	**S.E**	**B**	**T**	**Sig.**
(Constants)	1.060	0.312		3.477	0.001
Vertical coordination	0.214	0. 034	0.088	6.294	0.029
Horizontal coordination	0.189	0.026	0.049	7.269	0.010

R^2= 0. 571 R= 0.756, overall fit of the model F =45.459 at P = 0.000

To measure the impact of logistics cooperation on the effectiveness of disaster relief operations, the study utilized a multiple linear regression model. Initial findings revealed that the model had an R-square value of 0.571, an adjusted R-square value of 0.552, and a standard error of estimate of 0.244, as presented in the table. The coefficient of determination (R-square = 0.571) suggests that the two independent variables examined in this objective account

for only 57% of the influence on the effectiveness of disaster relief operations, while the remaining percentage is attributed to other logistics factors that were not investigated in this research.

Based on the model summary, the study concluded that logistics cooperation had a significant impact on the effectiveness of disaster relief operations. The fitness of the model was evaluated through analysis of variance (ANOVA) and the statistically significant value ($p = 0.000$) indicated that the model was adequate for predicting the effects of logistics cooperation on the effectiveness of disaster relief operations. Additionally, the results of the analysis of variance indicated that the two predictor variables, horizontal cooperation and vertical cooperation, were significant ($p < 0.05$) in relation to the effectiveness of disaster relief operations, as also illustrated by Chen and Yu (2022) and Moktadir et al. (2017) and Saleh et al. (2020).

The study indicates that when considering other factors in the model, horizontal and vertical cooperation were the most influential variables in relation to the dependent variable. Nonetheless, the study recognizes that there might be other factors affecting humanitarian logistics that were not addressed in this research, which could contribute to the remaining 2% of the effects on disaster relief operations' effectiveness. This cooperation could be explained in many forms, as covered from the study, mean the cooperation between the government (local and central) and the service providers in humanitarian operation (vertical cooperation) and between the suppliers and health organization (horizontal coordination). This may also mean engagement of the international agencies and organization to the fulfillment of a complete system of disaster relief operation with the country because we also depend on this partnership and cooperation (Song et al., 2021; Karanja et al. 2015; Wuhan Statistics Bureau, 2019; United Nations Coordinated Appeal, 2020).

The findings portrays that logistics cooperation contributes to ensuring effective disaster relief operations in addressing pandemic. The kinds of cooperation on this aspect may include; Cooperation between government and private health institutions, Cooperation between government and international relief organization, Cooperation between government and international relief organization, Cooperation between hospitals and manufacturer of medical equipment, Cooperation between transport service provider and private health institutions, and Cooperation between government and transport service providers (Chen & Yu 2022; Moktadir et al., 2017; Saleh et al. 2020).

CONCLUSIONS & RECOMMENDATIONS

6.1 Conclusion

It may be concluded that cooperation between the stakeholders is very crucial to having and ensuring effectiveness in disaster relief operations in addressing pandemic. Cooperation between the stakeholder in more connected in resources and facility cooperation, this means the stakeholder can cooperate in improving their facilities and collaboration and joining forces in terms of the resources that are needed disaster relief operations.

Basing on the findings relating to contribution of logistics cooperation to disaster relief operations, the study recommends the government to improve private-public partnerships regulations. The improvement of private-public partnerships that is specific deals with issues relating to pandemic disasters and crises. This study may also recommend the policy makers and the government toward having a legal framework and regulations that captures these aspects and necessitating the humanitarian organizations to form alliances in disaster relief operations. This will enable the key participants to be more informed about the government efforts on relief operations and also aids in the resources collaborations.

6.2 Implications on Policy

The study's results have significant implications for the Tanzanian government at both local and central levels. It highlights the importance of effective humanitarian logistics practices to ensure optimal disaster relief operations. Policymakers need to consider this as a strategic move to prepare for future disasters. The study recommends improving private-public partnerships to ensure effective cooperation and collaboration among stakeholders within and outside the nation's boundaries.

Stakeholders and policymakers can use the study's findings to enhance the effectiveness of disaster relief operations and the functioning of humanitarian organizations in humanitarian logistics. The study's results can be utilized to develop a framework that ensures sustainability in partnering and creating a risk management framework specifically designed for pandemics and relief logistical operations.

Moreover, the study's results suggest that involving logistics service providers significantly contributes to the effectiveness of disaster relief operations, reducing transportation and movement complications in relief operations. Therefore, decision-makers need to focus on improving laws and regulations concerning this specific set and help logistics service providers with infrastructural development while treating them as important stakeholders.

This study can be a useful tool for policymakers to establish frameworks that guide nations in implementing procedures to facilitate the movement of people and materials to affected areas and structuring standards to improve logistics during pandemic periods without violating normal operating procedures. Similarly, this study can provide resourceful information to humanitarian organizations to initiate and build relationships and cooperation with other international disaster relief organizations and other humanitarian organizations to strengthen logistics during pandemics' outbreak.

6.3 Recommendations

The study's findings suggest that effective disaster relief operations can be attained by implementing humanitarian logistics properly. This requires using appropriate indicators to assess the performance of humanitarian logistics, recognizing the significance of logistics cooperation and the role of logistics service providers in addressing pandemics. Humanitarian organizations must acknowledge the value of establishing collaborative systems and working with other stakeholders in disaster relief operations. Given that humanitarian logistics is crucial in disaster relief operations, it is essential that all stakeholders work together to ensure maximum participation and establish effective partnerships. Consequently, the success of disaster relief operations depends on having well-organized arrangements in place for humanitarian logistics.

The findings portrays that logistics cooperation contributes to ensuring effective disaster relief operations in addressing pandemic. The kinds of cooperation on this aspect may include; Cooperation between government and private health institutions, Cooperation between government and international relief organization, Cooperation between government and international relief organization, Cooperation between hospitals and manufacturer of medical equipment, Cooperation between transport service provider and private health institutions, and Cooperation between government and transport service providers.

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