
DISASTER RELIEF SUPPLY CHAIN MANAGEMENT AND THE EFFICACY OF EMERGENCY OPERATIONS IN ANAMBRA STATE, NIGERIA

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Abstract

This study investigated the effect of disaster relief supply chain management on the efficacy of emergency operations in Anambra State, Nigeria. The study was conducted in the eight Local Government Areas of Anambra State that had experienced recurrent flooding since 2010. A survey research design was adopted for the study. Two research questions and two null hypotheses were formulated to guide the study. The population comprised flood victims and stakeholders involved in emergency management activities within the study area. A total of 668 respondents participated in the study, consisting of 600 flood victims selected through simple random sampling and 68 officials of emergency management agencies and partner organizations selected through purposive sampling. Data were collected using the Disaster Relief Supply Chain Management and Emergency Operations Questionnaire (DRSCMEOQ) and an interview guide. The instruments were validated by experts in the Institute of for Development Studies, University of Nigeria, Nsukka, while the reliability was established using Cronbach's Alpha, which yielded a coefficient of 0.96. Data were collected through direct administration of the questionnaire and interview schedules. The data were analyzed using Analysis of Variance (ANOVA) and Multiple Linear Regression (MLR) at a 0.05 level of significance. The decision rule was to reject the null hypothesis when the p-value was less than 0.05 and accept it when the p-value was greater than 0.05. The findings revealed that measures of disaster relief supply chain management, including stakeholder integration, logistics management, stakeholder collaboration, volunteer involvement, and organizational commitment to disaster planning, did not significantly influence the efficiency of emergency operations. The study also revealed that the availability of technology and effective data management systems significantly enhanced the efficacy of disaster relief supply chain management. Based on the findings, the study recommended increased investment in technological infrastructure and efficient data management systems to improve emergency response effectiveness.

Keywords: Disaster relief, supply chain management, emergency operations, emergency response, flood disaster

Introduction

Disaster relief supply chain management has become a critical concern in contemporary emergency management due to the increasing frequency, complexity, and magnitude of natural and human-induced disasters across the world. The effectiveness of emergency operations during disasters remains a major challenge for governments, humanitarian organizations, and affected communities, particularly in developing countries where institutional and logistical capacities are often constrained. Despite substantial investments in disaster preparedness and response systems, disaster victims frequently experience delays in the delivery of relief materials, inadequate access to essential services, poor coordination among responding agencies, and inefficiencies in the distribution of humanitarian assistance. These challenges have raised serious concerns regarding the ability of disaster relief supply chain management systems to support

effective emergency operations and achieve timely humanitarian response. According to Tatham and Houghton (2011), humanitarian logistics operations are characterized by uncertainty, urgency, and complex coordination requirements, making efficient supply chain management essential for successful disaster response. Similarly, Onuoha (2009) observed that weaknesses in disaster management structures, resource allocation, and coordination mechanisms often undermine the effectiveness of emergency interventions in Nigeria. Since disaster relief supply chain management encompasses the planning, procurement, transportation, storage, coordination, and distribution of relief resources, any weakness within the supply chain system can significantly impede emergency response efforts, increase human suffering, and prolong the recovery process of affected populations.

The growing frequency and severity of disasters across the globe have further intensified concerns regarding the ability of emergency management agencies to deliver timely and effective humanitarian assistance (Antony, Bhuller, Kumar, Mendibil and Montgomery, 2012). In recent decades, compelling evidence has shown that disasters have increased at an unprecedented rate worldwide, resulting in significant loss of lives, destruction of property, displacement of populations, and disruption of livelihoods. This trend has largely been attributed to climate change, environmental degradation, population growth, urbanization, and extreme weather events. According to Munich Reinsurance (2002) and Thomas and Kopczak (2005), global economic losses resulting from disasters have risen steadily since the 1960s. Michel-Kerjan and Slovic (2010) attributed this increase to the concentration of people and assets in high-risk areas and the growing social and economic interdependencies that characterize modern societies. Consequently, governments and humanitarian organizations are increasingly confronted with the challenge of managing complex disaster situations under conditions of uncertainty and resource constraints.

Natural disasters such as floods, earthquakes, hurricanes, cyclones, landslides, volcanic eruptions, tsunamis, and pandemics continue to pose significant threats to human survival and socioeconomic development. These disasters often result in widespread devastation, displacement of populations, economic losses, and severe disruptions to community life (Dash, Mishra, & Mishra, 2013; Schultz, Koenig, & Noji, 1996; Nagurney & Qiang, 2009; Nagurney, Masoumi, & Yu, 2013). Recent global disasters, including the COVID-19 pandemic, Hurricane Irma in 2017, and the Mexico earthquake of 2017, have further demonstrated the increasing complexity of disaster response operations. Earlier catastrophic events such as the 2004 Indian Ocean tsunami, Hurricane Katrina in 2005, the Haiti earthquake in 2010, and the devastating floods that affected India and Pakistan in 2014 equally highlighted the importance of efficient disaster relief logistics and supply chain management systems. These events underscore the changing global disaster landscape and the urgent need for effective coordination of emergency response activities.

The challenges associated with disaster management are not limited to natural hazards alone. Economic, social, and political factors such as resource conflicts, terrorism, political instability, ethnic violence, religious persecution, and social exclusion have increasingly contributed to humanitarian crises around the world. Oliver-Smith (2006) argued that these factors are often interconnected and may significantly increase societal vulnerability to disasters. In Nigeria, the Boko Haram insurgency has resulted in the displacement of millions of people and the establishment of numerous Internally Displaced Persons (IDP) camps, thereby creating one of the country's most significant humanitarian emergencies (Klomannskog, 2008; Fasona & Omojola, 2010; Soneye, 2012).

Such crises have placed enormous pressure on emergency management institutions and humanitarian agencies responsible for providing relief and support to affected populations. The increasing occurrence of disasters has serious implications for national development. Disasters often reverse years of developmental progress by destroying infrastructure, disrupting economic activities, and diverting resources intended for development towards emergency response, rehabilitation, and reconstruction efforts (Obetta, 2014). Similarly, Lin (2010) observed that disaster recovery initiatives impose significant financial burdens on both national governments and international development agencies. Similarly, Thomas (2005) noted that the humanitarian aid sector continues to expand as both natural and human-induced disasters are projected to increase substantially due to climate change and extreme weather conditions. Consequently, the need for effective disaster relief systems has become more critical than ever.

Prearranged the resource-intensive nature of humanitarian operations, supply chain management has emerged as a vital determinant of disaster response effectiveness. Van (2011), Gilmore (211), and Thomas and Kopczak (2007) emphasized that logistics and supply chain activities constitute a substantial proportion of humanitarian operations. The Fridman and Miles (2002) estimated that approximately 80 percent of all disaster relief activities involve supply chain and logistics functions. Therefore, the success or failure of emergency operations is largely dependent on the efficiency with which relief supplies and services are coordinated and delivered to affected communities (Whybark, Melnyk, and Day, and Davix, 2010). Notwithstanding the strategic importance of supply chain management in disaster response, many emergency management organizations continue to face challenges relating to logistics planning, coordination, information management, stakeholder integration, resource allocation, and performance evaluation (Oloruntoba and Gray, 2006). These weaknesses have exposed limitations in the capacity of disaster management agencies to effectively coordinate relief efforts during emergencies. In Nigeria, recurring complaints have accompanied many disaster response operations despite claims of preparedness by relevant authorities. The National Emergency Management Agency (NEMA) and State Emergency Management Agencies (SEMAs) have frequently been criticized for operational inefficiencies, inadequate coordination mechanisms, delays in aid distribution, and weak accountability systems (Altay nad Green, 2006). Civil society organizations and affected communities have also raised concerns regarding poor oversight and the diversion of relief materials intended for disaster victims.

The devastating floods that affected several states in Nigeria in 2010 and their subsequent recurrence in later years illustrate the changing nature of the country's disaster landscape. These events exposed significant deficiencies in disaster preparedness, emergency response coordination, and relief distribution systems. According to Tomasini, and Van-Wassenhove (2009a) despite improvements in technology and socioeconomic development, disaster risks continue to increase, necessitating a reassessment of existing emergency management strategies, particularly with regard to supply chain coordination, information management, and inter-agency collaboration. Effective disaster relief supply chain management is essential for ensuring that relief materials and services reach affected populations promptly and efficiently (Taylor and Pettit, 2009). An effective supply chain has the potential to save lives, reduce human suffering, support recovery efforts, and facilitate the rehabilitation and reintegration of disaster victims into normal social and economic activities.

Recognizing the inevitability of disasters, governments around the world have established institutional frameworks to coordinate disaster management activities. In Nigeria, the National Emergency Management Agency (NEMA) serves as the apex disaster management institution at the national level, while State Emergency Management Agencies (SEMAs) and Local Emergency Management Committees (LEMCs) function as frontline responders at the state and local levels (National Emergency Management Agency, 2010). These institutions are responsible for coordinating disaster preparedness, response, recovery, and mitigation activities. However, existing disaster management structures continue to face practical challenges, including inadequate logistics expertise, poor coordination mechanisms, absence of standardized operating procedures, and weak performance measurement systems (Narasimhan, Swink, and Kim, 2006). The experience of past disaster response efforts in Nigeria therefore highlights the need for a more structured and integrated approach to disaster relief supply chain management.

It is against this background, this study examined disaster relief supply chain management and the efficacy of emergency operations in Anambra State, Nigeria. Specifically, the study evaluated existing disaster relief supply chain management practices and assessed their influence on the effectiveness of emergency operations. The study focused on Anambra State because of its recurrent exposure to flooding and other disaster events that have attracted both national and international humanitarian interventions. Particular attention was given to the eight Local Government Areas identified as highly flood-prone and classified under Category A in the Federal Government's 2012 Post-Flood Assessment Report. It is anticipated that the findings of this study will provide empirical evidence for strengthening disaster relief supply chain systems and contribute to the development of sustainable policies and integrated frameworks for effective humanitarian response in Nigeria.

Statement of the Problem

Disaster relief supply chain management has become an indispensable component of effective emergency operations, particularly in an era characterized by increasing occurrences of natural and human-induced disasters. The primary objective of disaster relief supply chain management is to ensure the timely procurement, transportation, storage, coordination, and distribution of relief materials and services to affected populations during emergencies. Ideally, emergency management agencies should possess efficient logistics systems, effective stakeholder coordination mechanisms, adequate technological support, trained personnel, and reliable information management systems capable of facilitating rapid and effective disaster response. Such systems are expected to ensure that relief materials reach affected victims promptly, resources are optimally utilized, humanitarian actors work collaboratively, and emergency operations achieve their intended outcomes of reducing human suffering, minimizing losses, and accelerating recovery.

However, the reality in many developing countries, including Nigeria, appears to be different. Despite the establishment of disaster management institutions and the increasing emphasis on disaster risk reduction, emergency response operations continue to experience significant challenges. Delays in the delivery of relief materials, inadequate coordination among stakeholders, weak logistics management systems, poor information sharing, limited technological support, and ineffective resource allocation have continued to affect the quality of emergency interventions. These challenges are often more pronounced during large-scale disasters when the demand for relief assistance exceeds

available resources and coordination mechanisms become strained. Consequently, affected communities frequently complain about inadequate response, delayed assistance, and inefficiencies in the management of disaster relief operations. In Anambra State, recurring flood disasters, communal conflicts, disease outbreaks, and other emergency situations have repeatedly tested the capacity of disaster management agencies and humanitarian organizations to respond effectively. Although considerable efforts have been made by government agencies and humanitarian partners to provide relief assistance during emergencies, concerns persist regarding the effectiveness of existing disaster relief supply chain management practices and their ability to support efficient emergency operations. The recurring challenges observed during disaster response activities suggest the existence of operational gaps that may undermine the overall effectiveness of emergency management interventions.

The problem of this study, therefore, is that despite the increasing importance of disaster relief supply chain management in enhancing emergency operations, the extent to which existing supply chain management measures contribute to the efficacy of emergency operations in Anambra State remains unclear. This knowledge gap creates uncertainty regarding the effectiveness of current disaster relief supply chain practices and limits the ability of policymakers and emergency managers to develop evidence-based strategies for improving disaster response outcomes. Consequently, this study sought to examine disaster relief supply chain management and its influence on the efficacy of emergency operations in Anambra State, Nigeria.

Objectives of the Study

The broad objective of this study is to examine disaster relief supply chain management and the efficacy of emergency operations in Anambra State, Nigeria. Specifically, the study seeks to identify existing gaps in disaster relief supply chain management and contribute to knowledge through the development of strategies that will enhance effective and efficient emergency service delivery. The specific objectives of the study are to:

1. evaluate the measures of existing supply chain management in Nigeria's emergency operation.
2. evaluate available technology, data management system and the efficacy of supply chain management in Anambra State.

Research Questions

To guide the researcher in the cause of this study, an attempt was made to answer the following questions:

1. What is the relationship between the measures of supply chain management and the efficacy of emergency operation in Anambra state, Nigeria?
2. What is the relationship between available technology, data management system and efficacy of supply chain management in Anambra state, Nigeria?

Hypotheses

H₀₁: There is no significant difference between the measures of supply chain management and efficacy of emergency operation in Anambra state.

H₀₂: There is no significant relationship between available technology, data management system and efficacy of supply chain management in Anambra state, Nigeria.

Methods

The study adopted a survey research design and was conducted in Anambra State, Nigeria, with particular focus on eight Local Government Areas that have consistently experienced flooding and attracted both local and international humanitarian interventions. The population of the study comprised residents of the identified flood-prone Local Government Areas as well as personnel of emergency management agencies and humanitarian partners involved in disaster relief operations within the state. A sample size of 668 respondents was used for the study, consisting of 600 residents selected from the affected Local Government Areas and 68 officials drawn from emergency agencies and partner organizations. The respondents were selected using a combination of simple random, multi-stage, and purposive sampling techniques. Data were collected using a structured questionnaire titled: Disaster Relief Supply Chain Management and Emergency Operations Questionnaire (DRSCMEOQ) and an interview guide. The instrument was subjected to content validation by experts in disaster management and measurement and evaluation to ensure its appropriateness and adequacy for the study. The reliability of the instrument was established using the Cronbach Alpha reliability method, which yielded a coefficient of 0.96, indicating a high level of internal consistency.

The questionnaires were administered directly to the respondents with the assistance of trained research assistants, while interviews and focus group discussions were conducted to complement the questionnaire data. A total of 575 completed questionnaires were successfully retrieved and used for the analysis. Data collected were analyzed using descriptive statistics, Analysis of Variance (ANOVA), and Multiple Linear Regression (MLR). Mean and standard deviation were used to answer the research questions, while ANOVA and MLR were used to test the hypotheses at a 0.05 level of significance. The decision rule was based on a criterion mean of 3.00; any item with a mean score of 3.00 and above was regarded as accepted, while any item with a mean score below 3.00 was regarded as rejected. For the hypotheses, a p-value less than or equal to 0.05 led to the rejection of the null hypothesis, while a p-value greater than 0.05 resulted in its acceptance.

Results

Research Question One: What is the relationship between the measures of supply chain management and the efficacy of emergency operations in Anambra State, Nigeria?

Table 1: Multiple Linear Regression Analysis on the Relationship between Measures of Supply Chain Management and Efficacy of Emergency Operations

Equation	R Squared	F	df1	df2	Sig.	Constant	B1
MLR	0.043	0.551	5	62	0.737	1.558	Varies

Dependent Variable: Efficiency of Emergency Operations

Predictor: Measures of Supply Chain Management

Data in Table 1 show the result of the Multiple Linear Regression (MLR) analysis conducted to determine the relationship between measures of supply chain management and the efficacy of emergency operations in Anambra State, Nigeria. The coefficient of determination (R^2) of 0.043 indicates that 4.3% of the variation in the efficacy of emergency operations was explained by the measures of supply chain management. The table further shows an F-value of 0.551 and a p-value of 0.737. Since the p-value is greater than the 0.05 level of significance, the result indicates that there is no significant

relationship between the measures of supply chain management and the efficacy of emergency operations in Anambra State, Nigeria.

Table 2: Coefficients of Measures of Supply Chain Management and Efficacy of Emergency Operations

Variables	B	Std. Error	Beta	t	Sig.
Constant	1.558	1.153	-	1.352	0.181
Level of Integration with other Stakeholders	-0.065	0.524	-	-	0.902
Organizational Level of Logistic Management in DRO	0.127	0.427	0.054	0.298	0.767
Integration with other Stakeholders	0.297	0.376	0.115	0.788	0.434
Level of Use of Volunteer Assistance in DRSCM	0.153	0.374	0.065	0.408	0.685
Organization's Commitment to Planning for DRSM	0.101	0.495	0.036	0.203	0.840

Dependent Variable: Efficiency of Emergency Operations

Data in Table 2 present the individual relationship between the measures of supply chain management and the efficacy of emergency operations. The result reveals that the level of integration with stakeholders ($p = 0.902$), organizational level of logistics management ($p = 0.767$), integration with other stakeholders ($p = 0.434$), level of volunteer assistance in disaster risk supply chain management ($p = 0.685$), and organizational commitment to planning for disaster risk supply chain management ($p = 0.840$) all have p -values greater than 0.05. This indicates that none of the measures of supply chain management significantly influenced the efficacy of emergency operations in Anambra State, Nigeria.

Research Question Two: What is the relationship between available technology, data management system and efficacy of supply chain management in Anambra State, Nigeria?

Table 3: Multiple Linear Regression Analysis on the Relationship between Available Technology, Data Management System and Efficacy of Supply Chain Management

Equation	R Squared	F	df1	df2	Sig.	Constant	B1
Linear	0.141	5.344	5	62	0.007	1.520	Varies

Dependent Variable: Efficacy of Supply Chain Management

Predictors: Available Technology and Data Management System

Data in Table 3 show the result of the Multiple Linear Regression (MLR) analysis conducted to determine the relationship between available technology, data management system, and efficacy of supply chain management in Anambra State, Nigeria. The coefficient of determination (R^2) of 0.141 indicates that 14.1% of the variation in the efficacy of supply chain management was explained by available technology and data management systems. The table further shows an F-value of 5.344 and a p -value of 0.007. Since the p -value is less than the 0.05 level of significance, the result indicates a significant relationship between available technology, data management systems, and the efficacy of supply chain management in Anambra State, Nigeria.

Table 4.4: Coefficients of Available Technology, Data Management System and Efficacy of Supply Chain Management

Variables	B	Std. Error	Beta	t	Sig.
Constant	1.520	0.331	-	4.590	0.000
Level of Technology Deployed in Disaster Management	0.103	0.104	0.131	0.987	0.327
Effectiveness of Organizational Data Management System	0.306	0.139	0.292	2.200	0.031

Dependent Variable: Efficacy of Supply Chain Management

Data in Table 4 reveal the individual contributions of available technology and data management systems to the efficacy of supply chain management. The result shows that the level of technology deployed in disaster management has a p-value of 0.327, which is greater than 0.05, indicating that it does not significantly influence the efficacy of supply chain management. However, the effectiveness of the organizational data management system has a p-value of 0.031, which is less than 0.05, indicating a significant relationship with the efficacy of supply chain management. The finding implies that an effective data management system contributes significantly to supply chain management efficacy, while available technology alone does not significantly influence supply chain management efficacy in Anambra State, Nigeria.

Discussion of Findings

The findings of the study revealed that there was no significant relationship between the measures of supply chain management and the efficacy of emergency operations in Anambra State, Nigeria. The result showed that variables such as the level of integration with stakeholders, organizational level of logistics management, integration with other stakeholders, level of volunteer assistance in disaster risk supply chain management, and organizational commitment to planning for disaster risk supply chain management did not significantly influence the efficacy of emergency operations. This finding suggests that the existence of supply chain management structures and practices alone may not necessarily translate into improved emergency response outcomes. It further indicates that operational inefficiencies, implementation gaps, and institutional challenges may have hindered the effective utilization of supply chain management measures during emergency operations. The findings are in consonance with the study of Thomas and Kopczak (2005), who posited that despite the growing recognition of logistics and supply chain management in humanitarian operations, many emergency management agencies continue to experience difficulties in translating supply chain structures into effective disaster response outcomes due to poor coordination, inadequate professional capacity, and limited institutional learning. The authors argued that the absence of effective implementation mechanisms often weakens the impact of supply chain practices on emergency response performance.

The findings are also consistent with the study of Kovács and Spens (2007), who observed that humanitarian supply chains are often confronted with uncertainties, resource constraints, poor infrastructure, and coordination challenges that limit their effectiveness during disaster operations. According to the authors, the existence of supply chain processes does not automatically guarantee operational success unless such processes are adequately integrated and efficiently managed. However, the findings disagree with the

study of Van Wassenhove (2006), who maintained that effective supply chain management significantly improves humanitarian response by enhancing coordination, reducing response time, and facilitating efficient resource utilization. The disparity between the present finding and that of Van Wassenhove may be attributed to contextual differences in institutional capacity, technological infrastructure, and operational environments. While developed disaster management systems may benefit significantly from supply chain management practices, such benefits may not be fully realized in environments where implementation challenges persist. The implication of this finding is that emergency management agencies in Anambra State may need to focus not only on establishing supply chain management structures but also on strengthening their implementation, monitoring, coordination, and evaluation mechanisms to achieve meaningful improvements in emergency operations.

The findings of the study revealed that there was a significant relationship between available technology, data management systems, and the efficacy of supply chain management in Anambra State, Nigeria. The result indicates that technology and data management systems play important roles in enhancing disaster relief supply chain management and improving emergency response outcomes. The finding further suggests that effective information management, communication systems, and technological support are essential for efficient planning, coordination, monitoring, and distribution of relief materials during emergency operations. The findings are in consonance with the study of Tatham and Houghton (2011), who asserted that information technology and data management systems enhance visibility, coordination, and decision-making within humanitarian supply chains. According to the authors, the availability of accurate and timely information enables emergency managers to allocate resources effectively and respond promptly to the needs of affected populations.

The findings are equally supported by the study of Jahre and Jensen (2010), who found that effective information sharing and technological integration significantly improve humanitarian logistics performance by facilitating collaboration among stakeholders and enhancing supply chain responsiveness. The authors emphasized that technology-driven information systems contribute substantially to operational efficiency during disaster response activities. Furthermore, the findings agree with the position of Pettit and Beresford (2009), who maintained that information and communication technologies are critical enablers of supply chain resilience and effectiveness in humanitarian operations. They argued that the ability to collect, process, and disseminate information in real time improves emergency preparedness and response capacity. The significance of this finding lies in its demonstration that technology and data management systems remain indispensable tools for effective disaster relief supply chain management. Consequently, emergency management agencies and humanitarian organizations should invest more resources in modern technological infrastructure, integrated information systems, and digital platforms that support timely decision-making and efficient emergency operations.

Conclusion

This study examined disaster relief supply chain management and the efficacy of emergency operations in Anambra State, Nigeria. The study was motivated by concerns over the increasing occurrence of disasters and the persistent challenges associated with the delivery of timely and effective humanitarian assistance to affected populations. Effective disaster relief supply chain management is essential for ensuring that relief

materials and services are delivered efficiently to disaster victims, thereby reducing human suffering and enhancing emergency response outcomes. Findings from the study revealed that the existing measures of disaster relief supply chain management, when considered collectively and individually, did not significantly influence the efficiency of emergency operations in the study area. This suggests the existence of operational gaps and inefficiencies within the current disaster relief supply chain system that may hinder effective emergency response. However, the study found that available technology and data management systems significantly influenced the efficacy of disaster relief supply chain management. Similarly, the quality of state bureaucracy was found to have a significant relationship with emergency response effectiveness.

The study therefore concludes that while disaster relief supply chain management remains a critical component of emergency operations, its effectiveness in Anambra State is constrained by inadequate technological infrastructure, weak data management systems, and institutional inefficiencies. Addressing these challenges is necessary for improving the quality of emergency operations and strengthening disaster response capacity in the state and Nigeria at large.

Recommendations

Based on the findings of the study, the following recommendations are made:

1. Emergency management agencies should strengthen the deployment of modern technology and integrated data management systems to improve information sharing, coordination, monitoring, and decision-making during disaster response operations.
2. Government should enhance institutional efficiency and administrative capacity within emergency management agencies through regular training, improved accountability mechanisms, and effective coordination among disaster management stakeholders.
3. Emergency agencies and humanitarian partners should develop and implement a more integrated disaster relief supply chain framework that promotes collaboration, resource optimization, and timely delivery of relief materials and services to affected communities.

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