CRITICAL SUCCESS FACTORS OF HUMANITARIAN LOGISTICS OPERATION: A CASE STUDY OF NIGERIA

TONY MENDY

MASTER OF BUSINESS ADMINISTRATION

IN

INTERNATIONAL LOGISTICS AND SUPPLY CHAIN MANAGEMENT

SCHOOL OF MANAGEMENT

MAE FAH LUANG UNIVERSITY

2024

CRITICAL SUCCESS FACTORS OF HUMANITARIAN LOGISTICS OPERATION: A CASE STUDY OF NIGERIA

TONY MENDY

THIS THESIS IS A PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF BUSINESS ADMINISTRATION IN INTERNATIONAL LOGISTICS AND SUPPLY CHAIN MANAGEMENT

SCHOOL OF MANAGEMENT

MAE FAH LUANG UNIVERSITY

2024

THESIS APPROVAL

MAE FAH LUANG UNIVERSITY

FOR

MASTER OF BUSINESS ADMINISTRATION

IN INTERNATIONAL LOGISTICS AND SUPPLY CHAIN MANAGEMENT

Thesis Title: Critical Success Factors of Humanitarian Logistics Operation: A Case Study of Nigeria

Author: Tony Mendy

Examination Committee:

Sunida Tiwong, Ph. D.	Chairperson
Samatthachai Yamsa-ard, Ph. D.	Member
Assistant Professor Nattapan Kongbuamai, Ph. D.	Member
Assistant Professor Tosporn Arreeras, Ph. D.	Member
Assistant Professor Pairach Piboonrungroj, Ph. D.	Member

Advisors:

.....Advisor

(Samatthachai Yamsa-ard, Ph. D.)

K. Nattapan .....Co-Advisor

(Assistant Professor Nattapan Kongbuamai, Ph. D.)

Dean:

.....

(Piyatida Pianluprasidh, Ph. D.)

ACKNOWLEDGEMENTS

I am deeply grateful to God for granting me strength throughout completing this master's thesis.

First and foremost, I would like to express my heartfelt gratitude to my academic advisor, Dr. Samatthachai Yamsa-ard, for his exceptional guidance, insightful feedback, and continuous encouragement throughout this research. His expertise and dedication have been a cornerstone in shaping this thesis, and I am truly fortunate to have benefited from his mentorship.

I also sincerely thank my co-advisor, Asst. Prof. Dr. Nattapan Kongbuamai, for his valuable insights, constructive criticism, and unwavering support. His contribution has significantly enriched the quality of my work, and I sincerely appreciate his time and effort.

To my friends and colleagues, thank you for your companionship, motivation, and understanding during the challenging moments of this journey. Your support has been a source of strength and inspiration, and I am grateful for the motivation and encouragement you shared.

Moreover, I am grateful to my family, whose love, patience, and sacrifices have made this achievement possible. To my Mum, Siblings, lovely wife, Therese Manneh, and children Sang Baptist Junior, Solance, and Denise, thank you for your unwavering belief in me, your emotional support, and the countless ways you have stood by my side.

Finally, I profoundly thank Mae Fah Luang University for the thesis writing grant that I received because, without it, it would have been challenging to conduct this research.

This thesis reflects the collective support and contributions of everyone mentioned above, and I am profoundly grateful to have such wonderful people in my life.

Thank you all from the depths of my heart.

Tony Mendy

Thesis Title	Critical Success Factors of Humanitarian Logistics Operation: A Case Study of Nigeria
Author	Tony Mendy
Degree	Master of Business Administration (International Logistics and Supply Chain Management)
Advisor	Samatthachai Yamsa-ard, Ph. D.
Co-Advisor	Assistant Professor Nattapan Kongbuamai, Ph. D.

ABSTRACT

Humanitarian logistics is pivotal in ensuring effective and timely aid delivery to communities affected by disasters. This thesis examines the critical success factors (CSFs) influencing the performance of humanitarian logistics operations. Employing multiple linear regression, the study analyzed data collected from key stakeholders in Nigeria involved in humanitarian supply chains, including government intuitions, UN systems, non-governmental organizations (NGOs), and other logistics providers.

Based on a thorough review of existing literature and experts' opinion, the research identified eight key CSFs at the operational level: engagement of supplier at an early stage, assessment accuracy, degree of information sharing, speed of delivery, quality, and availability of relief items, cost efficiency, community participation and trust, and security of relief items during transport and distribution.

Results from the analysis revealed that the quality and availability of relief items, cost efficiency and security of relief items during transport and distribution positively influenced overall logistics performance. This emphasizes the importance of safe-guarding relief items and personnel, which directly impacts beneficiary satisfaction and thus improves performance. Conversely, supplier engagement at an early stage, assessment accuracy, degree of information sharing, speed of delivery, quality, and availability of relief items, cost efficiency, community participation, and trust were found to have no significant relationship to logistics performance.

Keywords: Humanitarian Logistics, Critical Success Factors, Regression Analysis, Performance Management

TABLE OF CONTENTS

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABBREVIATIONS AND SYMBOLS

AHP	Analytical Hieratical Process
BSC	Balanced Scorecard
CSFs	Critical Success Factors
DEMATEL	Decision-Making Trial and Evaluation Laboratory
DVs	Dependent Variables
EM-DAT	The International Disaster Database
GDP	Gross Domestic Product
HL	Humanitarian Logistics
HLSCM	Humanitarian Logistics and Supply Chain Management
HOs	Humanitarian Organizations
HSCM	Humanitarian Supply Chain Management
HSC	Humanitarian Supply Chain
ICRC	International Committee of the Red Cross
IFRC	International Federation of Red Cross and Red Crescent Societies
IOC	Item Objective Congruence
ISM	Interpretive Structural Modelling
KMO	Kaiser Mayer Olkin
MCDM	Multi Criteria Decision Making
NGOs	Non-Government Organizations
OCSFs	Operational Critical Success Factors
SCSFs	Strategic Critical Success Factors
SCV	Supply Chain Visibility
SPSS	Statistical Package for Social Sciences
STO	Strategic, Tactical and Operational Framework
TCSFs	Tactical Critical Success Factors
TOPSIS	Technique for Order of Preference by Similarity to Ideal Solution
UN	United Nations

CHAPTER 1

INTRODUCTION

1.1. Background

Disasters are predicted to grow five times in the next 50 years (Khan et al., 2019; Abidi et al., 2013; Maon et al., 2009), thereby causing death, economic damages, disruptions in supply chains which would affect firm profitability and performance. Besides, this decade had witnessed an increasing number of disasters affecting the world from around 220 yearly in the mid-1990s to a current figure 350-400 yearly (Negi & Negi, 2021). According to (World Bank, 2016) report, 117 countries lose $520 billion in annual consumption as a result of disasters. The report also shows that over 26 million people are pushed into poverty annually as a result of calamities. In 2015 alone, there were 376 reported disasters that affected 98.6 million people globally, out of the 98.6 million affected, 22,773 lost their live and caused an economic damage of $70.3 billion (Loree & Aros-Vera, 2018). From the *(EM-DAT (Emergency Event-Database), 2023)* there were 497 disasters globally which affected 84 million people, killed 19,821 and caused a total economic damage of US$155.7 million. Most recently in 2022, the world recorded 594 disasters that affected 186.2 million people, 83,891 deaths and caused an economic damage of US$210,588,029 (*EM-DAT* (*Emergency Event-Database)*, 2023).

Due to growing urbanization, ecological deprivation, changing climate conditions, and political instability the impacts of disasters had also increased, mainly in developing countries (Li et al., 2016; Negi & Negi, 2021; Maon et al., 2009). In fact, over 90% of all major disasters occurred in developing countries (Maon et al., 2009). In Africa for instance, the number of disasters continue to rise (Damoah, 2022). Statistical data from the international disaster database, (*EM-DAT (Emergency Event-Database)*, 2023) indicate that Africa is the second most vulnerable continent at the regional level over the past decade, with 23% of all disaster incidents, accounting for 25% of total deaths and 18% of disaster-affected people worldwide. The occurrences

of flooding in some African countries had become a rule rather than an exception. Weak implementation of proactive strategies formulated towards pre- and post-disaster operation and management, poverty, geographical factors, availability of resources, limited infrastructure and early warning systems, poor building codes and construction standards etc makes the continent vulnerable to disasters (Gebremeskel et al., 2019; Damoah, 2022). Furthermore, it is anticipated that the global climate and anomalies, which pose a threat to developing nations, particularly those in Africa, will intensify the likelihood of disasters in the next decade by increasing the frequency and intensity of hazard events and making prone communities more vulnerable to already-existing hazards (Olanrewaju et al., 2019; Li et al., 2016). Hence the demand for relief aid for affected communities is likely to increase.

Although it may be impossible to completely prevent disasters, one can lessen their devastating effects on the lives of those impacted by preparation, mitigation, and effective response. The rise of disasters in recent years had also prompted increasing interest for humanitarian Logistics (HL) from academics and practitioners (Kovács & Spens, 2007; Kunz & Reiner, 2012; Santarelli et al., 2015; Goldschmidt & Kumar, 2016). Likewise humanitarian organisations (HOs) are heavily dependent on humanitarian logistics and supply chain management (HLSCM), as effective HLSCM operations was essential to the accomplishment of HOs goals (Shafiq et al., 2019; Shafiq & Soratana, 2020; Dubey et al., 2015; Maon et al., 2009). The 2004 Indian Ocean Tsunami demonstrated that the efficacy of emergency relief response depends on the speed and efficiency of logistics, reinforcing the importance of logistics' critical role in the delivery of humanitarian aid (Negi & Negi, 2021). The terms “humanitarian logistics” and “humanitarian supply chain management” were often used interchange-ably, and the definition and functions of both terms overlapped (Shafiq & Soratana, 2020b). The term humanitarian supply chain management (HSCM) is defined as the coordination and integration of various internal and external stakeholders, while humanitarian logistics (HL) is defined as the process of planning, implementing, and controlling the efficient, cost-effective flow and storage of goods and materials, as well as related information, from the point of origin to the point of need to meet the end beneficiary's requirements (Tatham et al., 2015; Kunz & Reiner, 2012; Negi & Negi, 2021). According to Van Wassenhove (2006), it is also referred to as a process or

system that entails using knowledge and abilities to organise people and resources to support impacted and vulnerable communities. HSCM is centred on relationships among the actors that make logistics movement possible and is acknowledged as essential to effectively execute any disaster response (Shafiq & Soratana, 2020b; Gizaw & Gumus, 2016; Damoah, 2022). On the other hand, HL involves planning, sourcing, warehousing and inventory management, transportation, sorting, packaging, tracking, tracing customs, and clearance (Khan et al., 2019). The demands of victims and the size and scope of disaster responses may fluctuate significantly depending on the location, timing, nature, and intensity of disasters. However, the primary goal of relief operation is to quickly reach those in need and provide aid. Furthermore, as highlighted by Negi & Negi (2021), the important activities of HL are (I) provide an adequate supply of commodities in perfect quality (II) proper coordination and prioritisation among the usage of limited transportation (III appropriate staging, storage, and movement of volume of goods (IV) effective movement of people to safest arears and (V) explicit transfer from the outside of the affected area. Notably, Van Wassenhove, (2006) asserted that, compared to 15% of operational costs in the business sector, around 80% of disaster relief costs were often spent on logistics. With the time and money invested, logistics also kept track of the organization's operations. It compiled all mission-related data, serving as a source for analysis and drawing lessons from past experiences (Agostinho, 2013). Therefore, advances in logistics and supply chain management have a direct impact on how quickly HOs can respond to disasters and how effectively they operate (Azmat et al., 2019; Agostinho, 2013). Thus, HL is a crucial component to effectively respond to the urgent needs of the affected populations in emergencies (Kunz & Reiner, 2012b).

The main features that differentiate HL from commercial logistics are the unpredictability of demand, the suddenness of its occurrence, the high stakes associated with the timeliness of deliveries, and a lack of resources (Beamon & Balcik, 2008; Vitoriano et al., 2011; Santarelli et al., 2015). Hence, this reveals challenges confronted by humanitarian logisticians. The Fritz Institute (2004) identified several obstacles to HSCM in Africa, including a lack of skilled logisticians in the field, poor infrastructure, a lack of collaboration, a lack of recognition of logistics, the availability of resources, a lack of knowledge and experience, and a lack of standards and indications. These

challenges and bottlenecks to HOs in rendering efficient and effective service delivery to people needing humanitarian intervention. The prompt distribution of aid to beneficiaries is crucial for reducing suffering, saving lives, and upholding human dignity. Hence, it is essential to recognize the elements that must be improved in the supply chain for humanitarian aid. Without these elements, developing a clear direction would not be easy, and achieving goals would be highly challenging. These factors are required to evaluate and reveal the viability of plans (Anand & Grover, 2015).

However, limited resources make it impossible to improve all factors simultaneously. To address this limitation, the study explores elements that are crucial to improving performance, and these factors are called Critical Success Factors (CSFs). CSFs were the limited number of areas in which results if they were satisfactory, would ensure successful competitive performance for the organization (Talib et al., 2015a). Freund (1988) highlighted that (I) CSFs must be important to achieving overall corporate goals and objectives (II) measurable and controllable by the organization to which they apply, (III) relatively few because not everything can be critical (IV) expressed as things that can be done and not the end point of the process (V) applicable to all organizations in the industry with similar objectives and strategies and (VI) hierarchical in nature, because while some CSFs would pertain to the overall organization, others would be more narrowly focused in one functional area.

To this end, it is important to pursue the factors holistically, understand them more rationally, and distinguish between strategic, tactical, and operational levels to directly reflect each business or functional unit within the organization (Freund, 1988; Leidecker & Bylwo, 1984; Gunasekaran et al., 2001; Azmat et al., 2019; Lager and Hörte, 2005; Pettit & Beresford, 2009; Ram & Corkindale, 2014; Trkman, 2010; Zhou et al., 2011). This classification according to Freund (1988) enables management to handle CSFs in a hierarchical manner, starting with strategic and ending with operational, and can lead to improved financial outcomes and competitive performance for the organization. CSFs are hierarchical in nature because they comprise higher-level strategic factors that direct the organization's overarching vision and goal in addition to middle-level tactical factors that concentrate on a single operational or functional area (Ika et al., 2012). These CSFs are from a supply-side perspective because they decide how efficient and effective HOs are in rendering services to affected communities.

Overall management involvement could make a great impact on decision-making processes at all managerial levels in the organization. As the success of organizations were based on the pillars of decisions, irrespective of the nature, size, and orientation, HOs had to make appropriate decisions at the right time (Gunasekaran et al., 2001; Kuruppuge & Gregar, 2020).

The strategic, tactical, and operational (STO) framework was first proposed as a planning tool for supply chain management. The framework offers an organised method to consider issues from the strategic, tactical, and operational perspective (Arababadi et al., 2017). The strategic level was a high-level plan that formed the foundational basis of a policy and would set the long-term goals to be achieved. The tactical level describes the procedures and incremental short-term plans to achieve the goals set at the strategic level. While the strategic plan responded to "What?" questions, the tactical plan responds to "How?" The tactics utilized to carry out the goals set out at the strategic level were described at the tactical level. The final set of factors was operational level factors, which outlined daily responsibilities and provided a plan for reaching tactical goals in a reasonable amount of time (Arababadi et al., 2017; Wankmüller & Reiner, 2020). Strategic decisions were made at the headquarters level using information provided by the field, tactical decisions were coordinated at headquarters, regional, national, and the field. Finally, the operational decisions were frequently made in the field without consulting anyone else (Pedraza-Martinez & Van Wassenhove, 2012;Wankmüller & Reiner, 2020). Hence, to improve efficiency, the main goal of this research is to explore CSFs at the response phase and, most significantly, at the operational level. Even though the immediate response phase had been identified by research as an essential aspect to study in the HSC, it was also one of the critical challenges of HL operations (Walton et al., 2011). Thus, the authors have found it an interesting aspect to research. Since decisions at the operational level are often made in the field without any prior communication with others and are highly specific with a focus on short-term goals and involves dealing directly with beneficiaries. Hence, an adequate knowledge of critical factors at this level through empirical research is essential to improving performance in relief aid operations.

Performance measurement is essential to enhance the humanitarian supply chain (HSC) operations. Although recent advances in the literature were justified by the

rise in the number of research publications published on performance measurement in HSCs (Anjomshoae et al., 2022a) it is crucial to note that performance measures and measurement systems were still in their infancy in the HLSCM (Abidi et al., 2014 ; Lu et al., 2016). According to Anjomshoae et al. (2019), performance management activities were expensive and secondary tasks in HSC. Moreover, lack of centrally-captured data from operations, limited information technology infrastructure, lack of funding for IT infrastructure, chaotic environment after each disaster, lack of incentive for measurement in the non-profit sector, potential harmful media exposure, human resources issue, and organizational culture were challenges confronted by HOs to develop, implement, and maintain effective performance schemes (Davidson, 2006; Patil et al., 2022) that were aligned with their organization's goals and objectives. Thus, most HOs rely on annual reports, websites, fundraising promotions, and program descriptions (Anjomshoae et al., 2021). These initiatives had set standards for humanitarian relief projects and programs, though they had only included surveys, expert assessments, and public opinion polls in disaster relief (Anjomshoae et al., 2022). Furthermore, resource allocation and performance improvement management choices rarely employed these technologies as a foundation. Instead, they were mainly used for reporting purposes. Because of this, HOs had increasingly begun to see the necessity for empirical research that might offer perceptions into robust performance management systems that included several performance factors that could aid them in optimizing their operations (Anjomshoae et al., 2022a). In addition, several HOs also realized that to ensure competitiveness and growth in the humanitarian sector they relied greatly on performance measurement systems (Patil et al., 2022). Although there were literatures on performance measures in HLSCM, empirical research examined how HOs measured their performance and benchmarking techniques (Agarwal et al., 2022). Performance measurement significantly improved relief operation efficiency by evaluating and learning from recent and past disaster operations (Van Wassenhove, 2006). Moreover, performance measurement helped decision-makers made better decisions, provided feedback, and motivate employees to perform better (Akhtar et al., 2012). Therefore, it is imperative that providers of humanitarian services adapt, change, and reorganize their operations to enhance their efficacy, efficiency, and performance via transparency including disclosure, exactness, and clarity, as well as the elements of

transparency, including corporate governance, decision-making, and accountability (Khan et al., 2019). Ultimately, effective performance means carrying out tasks consistent with humanitarian principles and mobilizing and allocating adequate financial, material, and human resources in a manner that is pertinent, well-managed, accountable, unbiased, long-lasting, and guarantees high quality (Gizaw & Gumus, 2016).

An in-depth study of literature reveals that identifying and categorizing CSFs on the three levels of strategic, tactical, and operational management, is rarely seen. The closest study to this was the study of Abidi et al. (2013), however, the authors did not use empirical data at any of the levels. The authors identified CSFs from the case studies and differed from empirical research, which defined substantial requirements in terms of reliability and validity. While the validity was strong, the application of CSFs for HL requires valid and reliable instruments which are empirically derived. Even though, case study and expert interview are the two approaches often used to determine CSFs in the literature, which are, however, easily affected by the human subjectivity (Zhou et al., 2011; Ding & Liu, 2018). As highlighted by Shafiq and Soratana (2020) and Damoah (2022), quantitative research is required, to provide more empirical, well-constructed and well tested case studies, to better support the recommendations regarding the adoption of organizational effectiveness as an informing concept. The authors emphasised that qualitative studies were insufficient because they are primarily based on personal observations, opinions, and feelings, modified by the emotional impact of participating in disasters. Thus, this therefore augurs well for empirical research that investigates the CSFs required by HOs and decision-makers to carry out operations, which could aid in enhancing HL procedures and activities.

To fill this gap, this research selected Nigeria due to its massive population and the occurrence of disasters. According to the World risk report in 2022, Nigeria was ranked 62 out of 192 countries and had a high-risk index of 9.2. With a population of more than 190 million, Nigeria is the most populous country in Africa. As showed in Figure 1.1, Nigeria is situated on the continent's western coast near the Gulf of Guinea Shakeri et al. (2021), between longitude 2° 40’ to 14° 45’ east of the Greenwich Meridian and from latitude 4° 15′ to 13° 55′ north of the Equator. Thus, all the ecological zones found in the tropics are also found in the country. As a result, most of

the disaster common in the area also affect Nigeria. Natural disasters, including drought, epidemics, flooding, landslides, and storms, as well as man-made disasters like oil spills, terrorism, pipeline explosions, and accidents involving vehicles on the road and in the air, had affected the nation (Mashi et al., 2019; Shakeri et al., 2021).

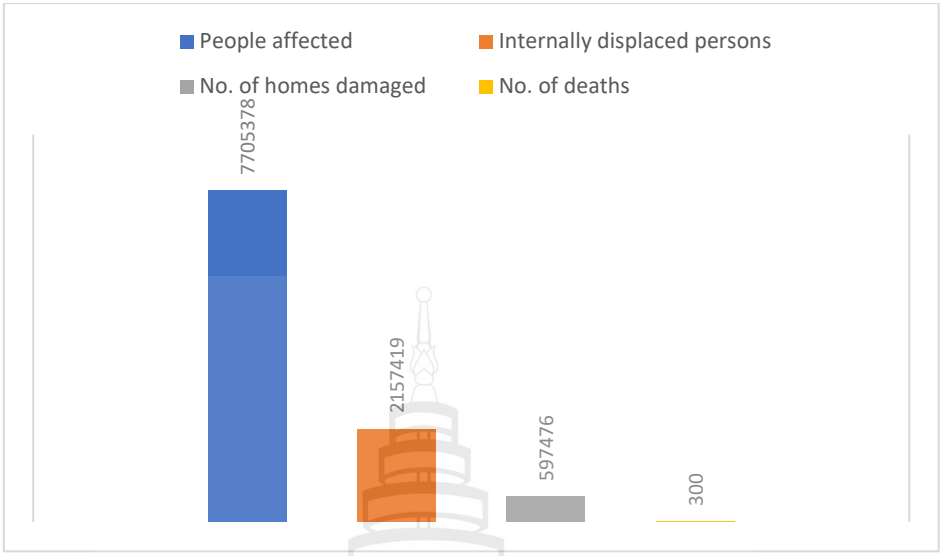
Source Lekwot et al. (2014)

Figure 1.1 Map of Africa showing Nigeria

Over the past two decades, Nigeria had witnessed 280 disasters that affected over 33 million people, 21,022 deaths, and total economic damage of more than US$5 million (*EM-DAT (Emergency Event-Database),* 2023). Approximately US$16.9 billion, or 1.4% of the GDP, were lost due to the 2012 flood. In addition, as illustrated in Figure 1.2, over 300 lives were lost, 7,705,378 people were affected, 2,157,419 of whom were recorded as internally displaced, and 597,476 of whose homes were either damaged or destroyed (Abbas & Agada, 2018). In 2018, Nigeria was ranked fourth among the top ten countries with the highest number of people affected by natural disasters, and in terms of death toll, Nigeria was ranked sixth in the same year; such disasters killed 300 individuals and impacted almost four million people (Shakeri et al., 2021). Like many other African countries, Nigeria's disasters were caused mainly by

climate and weather-related hazards such as drought, disease outbreaks, storms, and flooding. Most occurrences were triggered by continuous rainfall, which released water from dams, and increased the water levels of the rivers (Obeta, 2014 ; Olanrewaju et al., 2019; Mashi et al., 2019). Poor drainage systems, non-adherence to physical planning regulations, waterlogged soils, poor waste management, weak engineering during road construction, and unregulated urbanization caused flooding (Abbas & Agada, 2018; Shakeri et al., 2021). Furthermore, an increasing number of people lived in disaster-prone areas, exposing them to high risks of natural and human disasters. This was partly due to inefficient development control systems and an ever-expanding population (Mashi et al., 2019).

Nigeria like many African countries were faced with several challenges of HLSCM. Some of these challenges includes lack of logistics expertise and preparation, financial resources and capacity building (Shakeri et al., 2021; Mashi et al., 2019). Soneye (2014) and Shakeri et al. (2021) concluded that lack of cooperation and collaboration amongst the actors and management stakeholders caused more disorderliness than the disasters. Furthermore, lack of early warning systems and evaluations and lack of data and poor data scales also affect effective disaster management (Olanrewaju et al., 2019). Therefore, the weak chains of operations affect effective aid delivery. Due to these challenges, the researcher believes the findings of this research would help decision-makers prioritize aspects and use their limited resources most efficiently.



Source Abbas et al. (2018)

Figure 1.2 Disaster data of Nigeria's 2012 Floods

The objective of this study is to establish the relationship between CSFs at the operational level and performance for HL. This study provides managers and practitioners with an insight into the crucial factors that have a role in effective relief aid operation. It is important for practitioner and stakeholders to know the CSFs that focuses on rescuing people, serving maximum number of victims, and saving more lives. To do so, the study selected CSFs which relates to the efficient management and flow of goods, services, and information to respond to the urgent needs of victims.

This study extends the body of knowledge regarding CSFs for HL from three perspectives. Firstly, most research in CSFs for HL has focused on the strategic level, thus revealing OCSFs that are essential to improve relief aid would help managers to have a clear and explicit understanding of the factors relevant to their organization's operations and what actions to take to succeed. Which would require management to develop measurement tools to enable them to track the performance of each CSF. Managers and decision-makers could use identified CSFs to plan, prioritize, and develop strategies to achieve organizational goals. Furthermore, it would enable managers direct their resources, time, and efforts to improve the performance of relief aid operation. Secondly, considering the population, reoccurrence of disasters, and the number of people affected by disasters in Nigeria, yet based on the researcher's

knowledge, there is no study of CSFs for HL in Nigeria. This study aims to close the gap by gathering information from practitioners who have vast knowledge of HL operations in Nigeria. Hence, this study would provide a framework of CSFs that managers and practitioners could use in serving affected communities. Third, given the fact that case studies and expert interviews were the two methods most frequently employed in the literature to determine CSF, which was affected by human subjectivity (Zhou et al., 2011; Ding & Liu, 2018). Thus, this research contributes methodologically by utilizing regression analysis to establish the relationship between OCSFs and performance in HL. Regression analysis is a statistical technique for estimating among variables which have reason and result relation. Regression analysis is performed so as to determine the correlations between two or more variables having cause-effect relation, and to make predictions for the topic by using the relation (Uyanık & Güler, 2013). Regression could be univariant or multivariant analysis. Regression analysis with more than one independent variable is called multivariant regression analysis (Marill & Lewis, 2003; Uyanık & Güler, 2013). The multiple linear regression is a widely used method within the social science research and practice (Tranmer et al., 2020). In multivariant regression analysis, an attempt is made to account for the variation of the independent variables in the dependent variable synchronically (Uyanık & Güler, 2013). To substantiate the validity of items for measurement, the researchers used item objective congruence (IOC) for each construct.

1.2 Research Objective

The research is aimed at exploring crucial factors that are essential to improve relief aid operations. The research will identify and classify the CSFs into three levels of strategic, tactical, and operational management, where they would be most appropriate for a fair decision. More specifically the research is focused on the operational CSFs (OCSFs) to improve performance in HL. Moreover, the study's main objective is to understand the relationship between the operational CSFs and performance so that managers and practitioners could pay more attention to them.

1.3 Expected Outcomes

The research is to assist stakeholders to understand the relationship between the OCSFs and performance of humanitarian logistics to enable them to focus their time, effort, and resources on vital factors for success. The result would also help HOs not only in Nigeria to improve performance in relief aid operations. As for its contribution to academics and theory, the research would provide the foundation for better understanding of framework of OCSFs for efficiency in HL operation.

1.4 Scope of Study

The target sample are organizations working in the humanitarian sector providing relief to disaster victims within Nigeria. Because the population of humanitarian aid organizations in Nigeria were not known, the study purposefully focused on the humanitarian aid organizations in government, UN systems, NGO, and other institutions actively involved in humanitarian work throughout the country. The respondents are aid worker at the operational level which includes senior management, junior management, supervisors and junior staff since they are equipped with sufficient information of relief aid operations and have an in-depth understanding of HL in their organizations. As this research is a quantitative study, goggle questionnaires were utilized as a research instrument for data collection. The data was collected between December 2023 and August 2024. The unit of analysis are operational level practitioners (i.e., supervisors, coordinators, officers, inspectors, clerks). The sample size was 276 practitioners across Nigeria. The study was established on the following independent variables; engagement of suppliers at an early stage, assessment accuracy, degree of information sharing, speed of delivery, quality and availability of relief items, cost efficiency, community participation and trust and security of relief items during transport and distributions and their impacts on performance of humanitarian logistics.

The remainder of the paper is organized as follows: Section 2 contains an overview of critical success factors in commercial and humanitarian logistics as well as the classification of factors. Section 3 illustrates the research approach used and the

design to test the hypothesis. The analysis results are discussed in Section 4, and conclusions and further research direction are presented in Section 5.

CHAPTER 2

LITERATURE REVIEW

The literature review is broken down into four sections to help readers to better understand the logistics and supply chain for humanitarian aid and the value of CSFs. The development and explanation of CSF are covered in the first subsection. Since some CSFs in the commercial supply chain are pertinent to the humanitarian supply chain, the identification of CSFs in supply chain management is covered in the second subsection. The identification and classification of CSFs for supply chains and humanitarian logistics is the subject of the third subsection and the significance of performance measurement in the humanitarian supply chain is highlighted in the first subsection.

2.1 Critical Success Factors (CSFs)

Daniel in 1961 introduced CSFs to management literature for the first time, and Rockart in 1979 popularized it (Talib et al., 2015a). According to Daniel, the management approach must align with factors significant to the organization's success. In 1979 Rockart highlighted that CFSs were a few elements crucial for a business's performance, and managers must always pay close attention to them (Talib et al., 2015a). Several authors have stated the meaning of CSFs: Rockart defined CSFs as "the limited number of areas in business, if they are satisfactory, will ensure successful competitive performance for the organization (Talib et al., 2015a). Leidecker and Bylwo (1984) defined CSFs as" those characteristics, conditions, or variables that when properly sustained, maintained, or managed can have a significant impact on the success of a firm completion in a particular industry. According to Oloruntoba (2010), a CSF propelled a business ahead and might make or break it. Talib and Hamid (2015) mentioned that CSFs helped identify significant concerns in the planning and implementation, assist managers in better resource allocation, and employ established rules to monitor an organization's activities. Talib et al. (2015) highlighted that CSF

was a bias-free valuable method for identifying planning-implementation problems, boosting organizational effectiveness, and keeping track of an organization's actions and advancement. Finally, (Talib et al., 2015a) revealed that a few crucial business sectors must run smoothly; if they do, the organization will perform successfully. He contended that managers selected the essential pieces of information from the vast number of reports because they were eager to solve and repair problems as they arose and understood how important they were to the company's operation now and in the future. The distinction between what is essential to an industry and what is merely a necessary factor is not made clear by the descriptions. Furthermore, according to Ram and Corkindale (2014) and Trkman (2010), a factor is only deemed crucial if its existence and realization are shown to substantially increase success and competitiveness. That being stated, CSFs are a multifaceted concept that incorporates both external and internal organization control elements. They also have a statistically significant and positive association with the organization's success (Ika et al., 2012; Sharmin et al., 2021). CSFs served as an aid to management to strategize, plan, manage, monitor, and achieve organizational goals (Ram & Corkindale, 2014). However, Ram and Corkindale (2014) also highlighted that our current understanding of the role of CSFs was inadequate. This research argues that gaining an understanding of the role of CSFs for HLSCM through quantitative study is essential for relief aid operations success. Several authors had considered the significant role of CSFs within commercial and humanitarian supply chain management (Power et al., 2001; Gunasekaran and Ngai, 2003; Damoah, 2022). Although HSC operation differed from the commercial supply chain, the factors critical for success in most commercial sectors could be utilized in the humanitarian sector to improve its relief operations performance (Davidson, 2006; Pettit & Beresford, 2009).

2.2 Identifying Critical Success Factors For SCM

Since Rockard popularized CSFs in 1979, it has been widely used in fields other than information systems, such as supply chain management (Talib et al., 2015b). Studies and uses of CSFs could be found in the public sector, higher education, tourism,

knowledge management, internet marketing, new product creation, and human resource outsourcing operations (Talib & Hamid, 2015). This arises because every organization in various industries has elements essential to its success. Thus, organizations must be aware of these elements to comprehend their strengths, weaknesses, opportunities, threats, resources, and talents necessary for success (Talib et al., 2015b).

Several authors had discussed the significance of CSFs in logistics and supply chains. Good quality staff, ongoing investment, cost management, innovation, and development of measurement were the five essential elements that Chuang and Shaw (2000) highlighted as crucial to the fresh produce supply chain. In their study of the virtual supply chain, Gunasekaran and Ngai (2004) identified strategic alliances, web-based information systems, automation for business process and re-engineering, supply chain visibility, and performance management systems as key elements. Puschmann and Alt (2005) considered CSFs relative to e-Procurement in the supply chain. They highlighted the preparation of a catalog, embracement of suppliers at an early stage, automation of authorization workflow, creation of a central instance for supplier management, strategy for physical catalog hosting, integration of e-procurement system with other relevant systems, and redesign of the procurement process. The reverse supply chain CSFs identified by Hong et al. (2008) included costs, technical capability, government policy, organizational commitment, channel relationship, service quality, simplicity of use, perceived utility, and reverse supply chain performance. These CSFs in the commercial supply chain could also be relevant in enhancing humanitarian performance (Van Wassenhove, 2006; Pettit and Beresford 2009).

2.3 Identifying and Classification of Critical Success Factors in HLSCM

Given that both man-made and natural disasters were seemingly increasing in impact, frequency, and scale (Tatham et al., 2009), researchers and practitioners are paying much more attention to improving disaster and emergency response performance to alleviate suffering and save more lives. Since humanitarian

organizations aim to lessen suffering, CFSs must be identified to guarantee relief operations success to those in need and to reach them at the right time, place, and quantity. In achieving this objective, literature had identified factors for the cause of the success in humanitarian relief operations. According to Pettit and Beresford, (2009), CSFs were deemed crucial for maximizing the operational efficacy of the humanitarian supply chain.

Nevertheless, the application of CSFs in humanitarian aid is rarely seen. However, the works of Luo et al. (2006) and Pettit and Beresford (2009) were the first to address this issue, even though their factors were based on the work of different authors in the commercial supply chain (Abidi et al., 2014). Their factors include strategic planning, information management and technology utilization, human resources management, continuous improvement, and collaboration. Oloruntoba (2010) identified CSFs for the emergency relief chain and the management of Cyclone Larry in Australia. The Author used document analysis and semi-structured face-to-face interviews to unveil the CSFs. The Author then presented the CSFs under two headings: issues and factors in the pre-disaster preparedness and planning phase and issues and factors during the cyclone and its immediate aftermath. Factors such as speed of delivery, cost efficiency, and quality and availability of relief items were examined by Abidi et al. (2013b) as crucial success factors for enhancing the efficiency of HSC through a case study of one Dutch and one German humanitarian aid agency.

The findings of Celik and Taskin Gumus (2016) focused on determining and categorizing CSFs for emergency preparedness and response abilities for NGOs in Turkey. Utilizing a trapezoidal interval type-2 fuzzy set, analytical hierarchy process (AHP), and Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS), the authors identified information systems, warehousing, organization, transportation and distribution, and management and planning as CSFs for emergency preparedness and response. Li et al. (2014) adopted a decision-making trial and evaluation laboratory (DEMATEL) to identify ten crucial factors in emergency management, including a well-planned emergency relief supply system, a reasonable organizational structure, and a clear understanding of roles, an emergency response plan, and applicable regulations, a campaign to raise awareness of disaster prevention and response, a regular simulation of a disaster, government unity of leadership to plan

and coordinate as a whole, a timely and accurate assessment of relief needs, and security of relief items during transportation and distribution. Yadav and Barve (2015) research primarily addressed the humanitarian supply chain's CSFs that developed during the disaster preparation and rapid response phase. Government policies and organizational structure were two of the 12 elements the authors discovered; according to their findings, these two aspects are the most important, had the most significant influence, and serve as the foundation for the interpretive structure model hierarchy.

Bardhan and Dangi (2016) explored CSFs for relief operations performance in India. According to the authors, needs assessment, coordination level, preparedness level, and behavioural factors were the drivers and indicators of performance in relief operations. Azmat et al. (2019) investigated how religious and non-religious aid organizations handled a few CSFs. The authors also noted the distinctions in how Christian and Islamic aid organizations identified and prioritized crucial issues. The authors' research revealed significant disparities between some CSFs among religious and non-religious relief groups and between some CSFs between Christian and Islamic relief organizations. The authors in their work clustered the factors into two categories external and internal factors. The external factors were the religion of beneficiaries, culture, donor restrictions, influence, blocked supply lines and rugged topography, host government access and policies, and limited resources. The organization's religious affiliation, information collection, willingness for coordination and collaboration, organizational structure, organizational culture, and internal communication were the internal factors.

Behl et al. (2019) examined the case study of floods in India and investigated crucial factors for successful HSCM. The authors categorized these as cause-and-effect factors. According to their research, the use of an emergency response plan, the use of technology, and an appropriate organizational structure were found to be the most significant causal factors, while regular reporting and submission of information following floods, stable organization of a disaster-simulation environment before the disaster to ensure better preparedness, financial planning, and its execution, were found to be the most significant effect factors. Shafiq and Soratana (2020) identify CSFs for assessing the readiness of HOs for adopting lean management practices. Similar CSFs were proposed by Damoah (2022), who concentrated his research on CSFs in Ghana's

flood disaster management. The Author listed management procedures, education and training, materials and resources, infrastructure, stakeholder participation and cooperation, administrative procedures, innovation and technology, and sociocultural aspects as essential components in declining order. Utilizing correlation and multiple regression, Sisay and Liku (2022) explored the effects of supply chain management practices on organizational performance in the Gedeo Zone. The finding of the study revealed that supplier integration, information sharing, postponement, and outsourcing positively affect humanitarian relief performance.

Multiple regression analysis is a general system for examining the relationship of a collection of independent variables to a single dependent variable (Aiken et al., 2013). It is highly flexible and lends itself to the investigation of a wide variety of questions. Multiple regression can be used for description, prediction and theory testing which is perhaps the most important application for the development of psychology as a science (Aiken et al., 2013). The assumptions of multivariate regression analysis are normal distribution, linearity, freedom from extreme values and having no multiple ties between independent variables (Uyanık & Güler, 2013). Unlike the MCDM techniques such as AHP and TOPSIS which are not ideal for investigating the causal relationships between factors (Malesios et al., 2020).

Given that multiple regression analysis allows for predicting the dependent variable based on the impact of independent variables, several authors have used regression analysis in various disciplines, including HSCM. Huerta-Soto et al. 2023 applied multiple regression to explore the impacts of operational efficiency, competitive advantage, and increasing profitability in the implementation of machine learning in supply chain management process for sustainably development. Shobayo (2018) examined the effect of supply chain management on firm's operational performance in Nigeria manufacturing companies with specific interest on supply chain strategy and supply chain flexibility using a panel regression model. Utilizing multiple regression, Erastus Kiswili et al. (2021) explored the influence of supply chain responsiveness and waste management on performance of humanitarian aid organizations in Kenya. Using multiple regression and a case of humanitarian agencies in responding to Bududa Land Slide disaster in Eastern Uganda, Ahimbisibwe et al.

(2016) established the relationship between supply chain visibility, supply chain alignment, supply chain velocity and supply chain relief agility.

In summary, CSFs in HSC are much less developed than the commercial supply chain; however, most of the factors in the commercial sector can be relevant to the humanitarian sector (Davidson, 2006; Pettit & Beresford, 2009). CFSs from the existing literature are relevant to improve relief aid operations effectively and efficiently. This study now discusses selected CSFs in the three levels of management, as shown in Figure 2.1, and their importance to HSC, and finally uses regression to explain OCSFs' relationships with performance simultaneously through visualization and model validation.

Source Authors Own

Figure 2.1 CSFs and Levels of Management

2.3.1 Strategic Critical Success Factors (SCSFs)

Taking a broad organisational perspective, strategic management tackles the issues that determine how an organisation functions within its business environment (Pettit & Beresford, 2009). Therefore, strategic critical success factors (SCSFs) in humanitarian logistics refer to the long-term planning and decision-making that sets the

overarching direction and priorities of HOs (Kovács & Spens, 2007b). It pertains to the long-term planning and decision-making processes to achieve the overall goals and mission of HOs and agencies (Tomasini & Van Wassenhove, 2009; Pettit & Beresford, 2009). It involves setting the direction, priorities, and policies for disaster response and preparedness. SCSFs enable managers to identify the organization vision and strategic thrust, therefore, enabling them to prioritize operational activities and policies (Ika et al., 2012). In business literature, a strategic decision is a single or a combined decision which could affect the overall organizational functioning such as launching a new product, expanding the market share, or changing technology (Kuruppuge & Gregar, 2020; Khalifa, 2021). Examples of SCSFs in HLSCM include resources mobilization and allocation, policy and legislation, and strategic partnership (Van Wassenhove, 2006; Kovács & Spens, 2007b; UN Sphere handbook, 2018). Due to unpredictability and complexity of disasters, efficient organizational structures and sustainability are strategic approaches for performance (Tomasini & Van Wassenhove, 2009; Abidi et al., 2013b).

Moreover, another example of SCSFs is stakeholder cooperation and collaboration (Abidi et al., 2013b; Kovács & Spens, 2007; Tomasini & Van Wassenhove, 2009; Pettit & Beresford, 2009). However, the environments in which HOs operate don't always promote collaboration and don't give any one player control over the aid effort (Maghsoudi & Pazirandeh, 2016; Loree & Aros-Vera, 2018). A surplus of low-priority items may occur in disaster situations because of numerous uncoordinated entities attempting to mount a response without adequate coordination. This influx of cargo has the potential to clog an already congested transportation system because of access restrictions and infrastructure damage, which could lead to delays on high-priority goods deliveries to locations within the disaster area, increasing the time beneficiaries must wait to receive critical supplies (Loree & Aros-Vera, 2018). Therefore, building and maintaining partnerships with government agencies, UN systems, non-governmental organizations (NGOs), local communities, military, business, and other stakeholders is a SCSF (Tomasini & Van Wassenhove, 2009; Shafiq & Soratana, 2020). The benefit of building a strategic partnership is to access resources, expertise, and international support. Another strategic goal of partnering, especially with business, was to reduce operational costs and to improve the delivery

of humanitarian services. This could be achieved through accelerating the flow of materials and information, decreasing inventory levels and lowering supply chain costs through consolidation (Shafiq & Soratana, 2019). Besides, improving the effectiveness of response, strategic cooperation and collaboration served as a tool for risk sharing (Yadav & Barve, 2015). Organizational structures also affect an organization's success; therefore, it can be beneficial to put in place an effective structure that permits managerial autonomy at a subsidiary level, permitting the subsidiaries to develop distinct and creative approaches (Celik et al., 2014; Zhou et al., 2011b; Yadav & Barve, 2018; Li et al., 2014; Han & Deng, 2018).

Continuous improvement in the preparedness and response practices is another SCSF. It includes growth, benchmarking, performance measurement, collaboration, and knowledge (Abidi et al., 2013; Yadav & Barve, 2015). According to Pettit and Beresford (2009) and Li et al. (2014), significant progress had to be made within the humanitarian sector to achieve greater success. Hence to improve and promote efficiency and performance, it is important to optimize organization and keep clear awareness of responsibilities (Li et al., 2014b). Continuous improvement involves tracking key factors in the supply chain performance and benchmarking the activities of an organization against key performance indicators (Pettit & Beresford, 2009). This could be achieved by adopting robust information technology and communication, and effective data processing through the backing of government and top management (Kabra & Ramesh, 2015).

2.3.1.1Top management support & practice

Leadership practices are one of the most essential CSF in the humanitarian supply chain. It relates to strategic planning, organizing, stakeholder interaction, resource allocation, sticking with the status quo, fostering strategic supplier partnerships, promoting strategic purchasing, fostering communication between aid workers and victims (Damoah, 2022), and pushing for information technology adoption (Tummala et al., 2006). Moreover, suggested characteristics of top management support include enthusiasm, commitment, and ongoing execution. An organization's performance increases when top management integrates with diverse stakeholders, processes relevant information at the right time, and makes informed decisions considering its goals, core competencies, and limited resources.

For instance, long-term decisions are addressed through strategic planning, identifying resources, and weighing the advantages and disadvantages of potential outcomes. A long-term strategy ensured an organization was ready for what must be done when an emergency arises. Strategic planning involves establishing long-term connections with suppliers for goods regularly required in emergencies (Kovács & Spens, 2007)

2.3.1.2 Resources Mobilization

More resources are available to assist needy individuals as the supply chain becomes more efficient. Several humanitarian organizations need the means to provide services after obtaining the necessary donor funds (Balcik et al., 2010). Therefore, organizations rely on resources for their operations that are external to the organization (Damoah, 2022). Since HSC requires substantial investments, a complementary relationship exists between performance measurement and HOs funding (Patil et al., 2022). Therefore, strategic appeal approaches to a donor considering the rising competition for limited resources define a successful relief operation. However, HOs must ensure these resources are highly efficient because donors may only continue funding if they are well utilized (Beamon & Balcik, 2008).

2.3.1.3 Coordination & collaboration

Even though collaboration was only sometimes a guarantee that supply chain members will immediately reap the benefits (Balcik et al., 2010), only some organizations can satisfy beneficiaries' needs and wants (Jahre & Jensen, 2010). Organizations needed more resources to be adequate, and the risk of bottlenecks, i.e., capacity constraints, was always present (Balcik et al., 2010). Coordination in HSCM was organizing, aligning, and differentiating participating actors' actions based on the area's knowledge, know-how, specialization, and resource availability (Wankmüller & Reiner, 2020), thus bringing them together enhanced relief operations. Coordination was central to disaster response and emergency relief (Jahre & Jensen, 2010; Van Wassenhove, 2006). Coordination and collaboration referred to how vital humanitarian actors cooperate to standardize practices, shared pertinent and timely information, engaged in collective bargaining, shared technology investments, and created a pool of shared knowledge (Thomas, 2003). This helps to reduce suffering and loss of life while upholding human dignity. However, HSCM is challenging to implement due to the

diversity of actors, donor expectations and funding structures, competition for funding, unpredictability, resource scarcity/oversupply, and coordination costs. To attain such an accomplishment, coordination requirements must be met. The components included mutual understanding, openness to information exchange, regular communication, close bonds, and shared goals (Talib et al., 2015a). However, with HSCM, these factors remained a persistent difficulty (Kovács & Spens, 2009; Kabra & Ramesh, 2015). Strong cooperation emphasized direct, ongoing interaction and promoted joint planning and problem-solving activities (Gunasekaran et al., 2001).

2.3.1.4 Government policies and organizational structure

As the custodian of the policy statement or disaster statute and regulation, the government spelled out explicitly what each stakeholder's urgent response obligations were. Government plays a significant role in an emergency by working with various humanitarian organizations and establishing regulations that permit or prohibit outside assistance (Yadav & Barve, 2015). The actors involved in the humanitarian response to a disaster were coordinated and made more accessible by HOs, even though it was an external factor over which they had less control. Also, the government's facilitation services could significantly improve the effectiveness and efficiency of the relief effort (Kabra & Ramesh, 2015).

2.3.2 Tactical Critical Success Factors (TCSFs)

The tactical level factors are the building blocks from which operational leaps, which are often applied in sectional, departmental, or individual levels than the overall organizational level (Kuruppuge & Gregar, 2020). Decisions at the tactical level are generally made by the senior managers of the organization (Kuruppuge & Gregar, 2020). In military literature, tactics are defined as the immediate employment of forces and weapons to attain strategic objectives, or the art of handling forces in battle or the immediate presence of the enemy (Khalifa, 2021). So, tactics are the ingredients of strategy, and strategy without tactics is meaningless and futile (Khalifa, 2021). The TCSFs in HL focuses on medium-term planning and the coordination of resources and activities to implement the strategic plans. It bridges the gap between strategic objectives and operational execution, involving activities such as prepositioning of supplies, recruitment, and interagency coordination, and creating systems to monitor and provide feedback on the effectiveness of the organization development process (Tomasini &

Van Wassenhove, 2009). Tactics like being first to market or on-time delivery, require techniques to carry them out and procedures that facilitate the use of those techniques (Khalifa, 2021). For instance, the problems of where to locate the staging areas and what capacities they should have, were tactical factors for last-mile distribution (Cook & Lodree, 2017). Establishing robust information systems and technology infrastructure to support long-term planning and communication have an impact on the success of organization because it allows tracking, monitoring, and communicating about deliveries to beneficiaries (Van Wassenhove, 2006; Pettit & Beresford, 2009; Yadav & Barve, 2015). According to (Kovács & Spens, 2007), information systems are the single most crucial element in determining whether a disaster relief effort is successful or not. Despite the numerous benefits, its full utilization in HLSCM is still lacking (Kabra & Ramesh, 2015).

Supply chain visibility is another TCSF. Achieving visibility throughout the supply chain, from procurement to distribution, was crucial for tactical planning and decision-making (Kovács & Spens, 2011). According to Somapa et al. (2018), Caridi et al. (2014), and Maghsoudi and Pazirandeh (2016), supply chain visibility (SCV) gauges how simple it is for actors to get timely and accurate information that they consider necessary or beneficial for their day-to-day operations. It improves delivery performance, reduces inventory at all levels of the SC, speeds up modifying production schedules to satisfy changing demands, and raises the accuracy of demand forecasting (Somapa et al., 2018). It also gives better insight into customer requests and inventory levels (Maghsoudi & Pazirandeh, 2016; Somapa et al., 2018). It is assumed that supply chain visibility affects how activities are coordinated during a disaster's stages since it offers insights into the disaster relief procedures (Tomasini & Van Wassenhove, 2009; Maghsoudi & Pazirandeh, 2016). Improving supply chain efficiency requires uncertainty to be reduced, minimized, or even eliminated even though achieving it is more complex in relief aid because of the distressed or displaced affected communities (Pettit & Beresford, 2009).

Other examples of TCSFs includes strategically prepositioning relief supplies in warehouses or depots in disaster-prone areas, building the logistics and operational capacity of HOs because there are limited experienced logisticians working in the HOs (Pettit & Beresford, 2009) e.g., training volunteers in disaster response techniques and

warehouse management, quality management, inventory management etc. (Kovács & Spens, 2007; Tomasini & Van Wassenhove, 2009; Abidi et al., 2013).

2.3.2.1 Information Technology Utilization

Information technology is changing how HOs plan humanitarian responses and access and disseminate information. Technological innovation is creating entirely new areas in which HOs can improve the response to the disaster in the most efficient and effective ways. Technology and innovation are key critical factors in HSCM (Damoah, 2022; Yadav & Barve, 2015; Behl et al., 2019; Agarwal et al., 2022; Patil et al., 2022). The humanitarian information management system had been acknowledged as one of the determinants of success in relief operations (Wood et al., n.d.). Information flows, content, and system compatibility were frequently considered to be the most critical factors at the planning level (Gunasekaran & Ngai, 2003).

2.3.2.2 Well-planned emergency relief systems

Creating operational procedures for a reaction based on anticipated resource needs and capabilities entails anticipating a specific hazard based on specific events or recognized hazards at local, national, regional, or even global levels (such as earthquakes, floods, or disease outbreaks). Plans for contingencies need to be created, especially if there is evidence of frequent natural disasters (e.g., seasonal events such as floods, hurricanes or cyclones, and droughts). Because disasters could occur at any time, it is up to the HO's plans, preparedness, and response strategies to mitigate the situation and save more lives. Therefore, an organization's disaster preparedness and contingency plan was the foundation for effective and efficient supply chain performance in different humanitarian aid operations (Place & Banepa, 2021). Thus, the execution of humanitarian relief activities is managed and effective when a robust contingency plan, including supply chain management, was in place (Place & Banepa, 2021).

2.3.2.3 Training and capacity building

The Fritz Institute (2004) cited the need for qualified logisticians as a problem for HSCM. Nevertheless, neither the lack of coordination between humanitarian organizations nor the disregard for logistics in humanitarian relief is specific to Africa. Nonetheless, given the high proportion of logistical expenditures in humanitarian help, the low acknowledgment of logistics was surprising (Van

Wassenhove, 2006). The likelihood of achieving long-term objectives increases when attention is paid to people before enhancing the information. For instance, even if effective IT systems existed, expected results may materialize only after employees were trained and prepared to use them (Agostinho, 2013). According to Anjomshoae et al. (2017), talented professionals could help HSC objectives to be met, while Balcik et al. (2010) identified several qualified individuals as CSFs for the success of relief operations. As a result, trained personnel and proper staff training enhance analytic and operational skills. How could we reassure affected communities and other stakeholders that HOs could be relied upon to consistently uphold humanitarian values, standards of excellence, and best practices? (Larson & Foropon, 2018). Beneficiaries would not receive services that give them dignity if HOs do not teach their staff and motivate them to fulfill the standard. Staff motivation and performance are increased because of training that enables staff to relate to victims more effectively and comprehend their requirements.

2.3.2.4 Cultural intervention

Cultural intervention refers to the community's direction, influencing how the population views disasters and disaster management. Most often, a person's cultural perspective can affect how they viewed disasters and disaster risk reduction (Aboagye et al., 2013). Since the relief supply chain involves various actors with diverse cultures and languages, HOs need to recognize cultural differences to develop appropriate intervention strategies for whom they intend to work with or work for effective relief operations. According to Rodon et al. (2012) and Azmat et al. (2019), humanitarian literature revealed that cultural variations could reduce the efficacy of aid by interfering with operational coordination. Cultural interventions seek to lessen resistance and unleashed the workforce's full potential (Abidi et al., 2020).

2.3.2.5 On-time reporting to donors.

Most HOs highly rely on the government, corporations, and individuals to fund their relief operations. Timely receiving of sufficient funds related to how quickly HOs got the required amount requested for relief operations (Anjomshoae et al., 2019; Agarwal et al., 2022). To ensure a sustainable and steady flow of funds, HOs must prioritize reporting financial performance to donors. It defined how swiftly donors

receive funding reports according to the agreed-upon conditions (Anjomshoae et al., 2019).

2.3.2.6 Education campaign on disaster prevention and response

Lack of communication can lead to rumors, deteriorate trust, thwart solutions, and raise risks (United Nation Office for Disaster Risk Reduction, 2022.). Because disasters are unpredictable, educating the population to prepare for such events to minimize suffering and the negative impacts is one of the disaster risk reduction goals (Sendai Framework on Disaster Risk Reduction 2015-2030). Education relates to sensitizing communities or informing people about what to do when disasters strike. It could also be educating the communities about any disease that is prevalent in that area and how to avoid it. This may increase people's motivation and confidence to take informed action, changing how societies view disasters in the long run.

2.3.3 Operational Critical Success Factors (OCSFs)

The level at which significant operations and campaigns are organized, carried out, and maintained to achieve strategic goals within operational domains is the operational level (Kiszely, 2005). This level is generally the functional department within a business unit e.g., production, marketing, procurement, and sales (Freund, 1988). In HLSCM operations, there is no defined or standardized scope, but usually includes inventory, procurement, and transportation operations of the HOs (Shafiq & Soratana, 2020; Balcik et al., 2016). The identification of OCSFs enhances operational effectiveness thus helps managers and decision-makers to focus on the priority factors to improve emergency response which could ultimately lead to overall strategic success (Zhou et al., 2011).

The operational critical success factors (OCSFs) in HL deal with the short-term, day-to-day execution of logistics activities during ongoing crisis (Van Wassenhove, 2006; Pettit & Beresford, 2009). This includes transportation, warehousing, distribution, and other operational tasks to ensure that relief items reach affected populations effectively and efficiently. Effective HL is a purposeful action in addition to a tool for cost savings due to enhanced operational efficiency in the distribution, delivery, and planning of aid (Yadav & Barve, 2015). Considering the unpredictability of demand and the high stakes associated with the timeliness of deliveries in HLSCM (Beamon & Balcik, 2008), HOs must endeavor to strategize

operational approaches that would ensure effective and efficient operations in dispensing relief aid to beneficiaries.

Inventory operation is a good example of OCSFs, which is a core logistics function in disaster relief (Pettit & Beresford, 2009; Shafiq & Soratana, 2020). In the HL inventory operation, push must occur first into critical storage areas before pull systems are employed to obtain the specific area of demand, in contrast to the commercial supply chain where pull systems dominate inventory operation (Pettit & Beresford, 2009; Yadav & Barve, 2015; Kovács & Spens, 2007). Inventory management decisions could be for pre-disaster and post-disaster. The number and location of warehouses, the kinds and quantity of relief goods to be stocked, and other factors should all be considered when HOs choose to pre-position inventories (Ertem & Buyurgan, 2013). These decisions involve careful planning, and management effort. The pre-disaster phase primarily focuses on the long-term pre-positioning decision, which entails stockpiling emergency supplies in key areas ahead of time to enhance post-disaster response (Balcik et al., 2016). For HOs to mobilize and deliver supplies swiftly following a disaster, effective pre-positioning is crucial given the uncertainty surrounding the timing, location, and volume of demands for emergency supplies (Balcik et al., 2016; Pettit & Beresford, 2009; Yadav & Barve, 2015; Shafiq & Soratana, 2020). Nevertheless, inventory prepositioning can be very ineffective if the demand surge is high, it can also lead to underutilized resources especially when disasters are not frequent or if the demand is low (Aghajani & Torabi, 2020; Ghavamifar et al., 2022; Liu et al., 2019). The inventory management for OCSF focuses on inventory operation after a disaster occurs which address short-term and day-to-day decisions given the information about an occurred disaster. For example, the replenishment of relief supplies at a humanitarian warehouse from an external supplier, and kept stock served to beneficiaries from the warehouse (Balcik et al., 2016).

Procurement is another OCSFs for relief aid (Shafiq & Soratana, 2020; Aghajani & Torabi, 2020). Effective relief procurement processes, whose related activities comprise nearly 65% of expenses in HO had a direct impact on how well victims' needs are met by the response (Ghavamifar et al., 2022; Shafiq & Soratana, 2020; Ertem & Buyurgan, 2013). Procurement process activities include identification of needs, requisition of needs, announcement of tenders, evaluation of tenders, purchase

orders, delivery of supplies, inspection of supplies, and payment to vendors etc. (Shafiq & Soratana, 2020; Aghajani & Torabi, 2020). Aside from being one of the most important issues in HL, procurement decisions also affect optimal decisions made on transportation, storage, and distribution of relief items (Aghajani & Torabi, 2020; Ertem & Buyurgan, 2013). Procurement in HL operations could be either proactive or reactive (Aghajani & Torabi, 2020). Proactive procurement is done before the disaster onset which addresses mitigation and preparedness and is necessary for prepositioning relief items, thus reduces the lead-time and has an advantage because HOs have enough time to acquire supplies from various suppliers, compare their quality, availability, and cost. However, safeguarding pre-positioned inventory, preserving their condition and transportation was a costly investment for HOs considering their limited resources (Ertem & Buyurgan, 2013; Liu et al., 2019). On the other hand, reactive procurement was post-disaster which was unavoidable due to unpredictability of location, timing, and severity of disasters (Aghajani & Torabi, 2020). Unlike procurement before disaster, more operational decision was required for procurement after disaster onset because there was often demand mismatch and operational problems in practice for gifts-in-kind, funding, and coordination (Ertem & Buyurgan,2013; Ghavamifar et al., 2022). Therefore, utilizing effective procurement methods at pre-disaster and most especially at post-disaster to meet the immediate needs of beneficiaries is necessary for a successful relief operation. Establishing coordination among humanitarian actors, long-term flexible contract with supplier in the preparation phase to strike a balance between risking shortages and wasting resources and short term engaged suppliers are the ultimate means to responding effectively to affected communities as well as minimize cost in procurement operation (Ertem & Buyurgan, 2013; Ghavamifar et al., 2022; Aghajani & Torabi, 2020; Liu et al., 2019).

Transportation and distribution are critical and significant component of HLSCM, at the operational level. It includes the need to handle issues with the appropriateness of distribution vehicles, designing delivery routes, and allocating supplies among distribution points, distribution speed, personnel suitability, network suitability, cost minimization, and inventory and personnel safety in such circumstances (Pettit & Beresford, 2009; Celik et al., 2014; Cook & Lodree, 2017). It is the second largest operations cost of HOs (Celik & Taskin Gumus, 2018; Pedraza-Martinez & Van

Wassenhove, 2012). Approximately 80% of the overall costs of relief could be covered by the transportation of resources, such as relief supplies and equipment, to the disaster location along with all predecessor and successor operations (Abazari et al., 2021). While procurement and warehousing guarantee that goods are available in the appropriate quantity, transportation enables quick delivery (Yadav & Barve, 2015). Therefore, the modes of transportation which influence the cost, capacity, and speed require operational decision-making. The choice of transport mode for instance depends on the need at the disaster area, cost, and suitability of infrastructure. Normally in disaster situations, transport infrastructures are destroyed, and fleets are organized at the disaster location from available resources (Pettit & Beresford, 2009; Safeer et al., 2014). In such situations, humanitarian operations become more complicated, transport options are limited which causes HOs to compete leading to an increase in cost as demand outstrips supply. Though relief distribution is time and cost dependent, quick response and demand satisfaction outweigh cost in humanitarian operations (Safeer et., al 2014). Therefore, delivering the right goods at the right place, with the shortest possible time to those who need it the most is the objective of HOs. Using innovative distribution strategies is paramount. Kovács and Spens (2007) argued that the use of centralized distribution facilities was obsolete because victims are usually weakened and cannot travel long distances to receive aid.

Security is a crucial factor in dispensing aid to victims, especially in war zones (Kovács & Spens, 2007). In Nigeria for instance, the Boko Haram insurgency has placed a tremendous humanitarian challenge in the country. Despite significant progress against the insurgency by the Nigerian Armed Forces and the Multi-National Joint Task Force, Boko Haram continued to carry out attacks in northeastern Nigeria and the Lake Chad Region throughout 2016, including suicide bombings, widespread sexual and gender-based violence (SGBV), kidnappings, and forced recruitment (Abdulkarim et al., 2022). This insurgent group may even wish to obstruct the delivery of these supplies. After natural disasters, looting may also happen since vehicles frequently halt and stray from their planned route (Kovács & Spens, 2007). Therefore, providing security during transportation and distribution of relief aid would allow suppliers to reach their intended destinations.

2.3.3.1 Engagement of suppliers at an early stage

The procurement of relief items is one of the primary operations of HL, that, if properly carried out, could save the lives of many victims (Nikkhoo et al., 2018). However, the unpredictability of demand, lack of coordination among humanitarian actors, short lead times, late deliveries from suppliers, and disruption in the availability of suppliers have been identified as the main challenges associated with relief procurement (Ghavamifar et al., 2022). Stockout or excess storage of relief items is another challenge (Liu et al., 2019; Nikkhoo et al., 2018). To overcome these challenges, HOs must ensure a balance between risking stockout and excess storage of relief items. This can be achieved by prepositioning stock, long-term contracts, or short-term engaged suppliers, so that when a disaster strikes, it is only necessary to move the stored items to the afflicted areas or send a purchase order to the supplier (Lamenza et al., 2019). Even though maintaining good relationships with short term engaged suppliers served as a cost efficiency driver, according to (Shafiq & Soratana, 2020), it was still a research gap. A good example of an effective pre-positioning of emergency supplies and materials took place in Indonesia in May 2006. Aid agencies were notified of the Mount Merapi volcano's increased activity, and supplies were positioned in anticipation of a large-scale local population relocation and potential casualties (Pettit & Beresford, 2009). This had led to less problem than are often experienced when the disaster occurred. Therefore, embracing suppliers at the preparation phase could offer a promising avenue for successful procurement processes, thus strengthening the overall response capacity, improving efficiency, and enhancing the ability to meet the needs of affected populations effectively (Wankmüller & Reiner, 2021; Lamenza et al., 2019). Establishing relationships with suppliers early on not only identifies reliable partners who can provide essential goods and services during emergencies but also ensure procurement flexibility, secure commitments, and facilitates collaboration, information sharing, and effective coordination (Balcik et al., 2010; John et al., 2022; John & Gurumurthy, 2022). Because in the humanitarian context, budgets are often limited, and resources need to be utilized efficiently (Liu et al., 2019). Therefore, developing long-term partnerships and negotiating favorable pricing and contractual terms or framework agreements with suppliers can lead to cost savings. Quality assurance also reduces the risk of distributing substandard or

inappropriate items and promoted joint problem-solving and the ability to adapt to evolving needs and circumstances (Ertem & Buyurgan,2013). Early engagement fosters partnerships, optimizes logistics processes, and ultimately ensures the timely and effective delivery of aid to those in need. The timely delivery of supplies and goods is essential to the success of HO disaster operations, and this can only be achieved by building strong relationships with potential suppliers.

H1. The embracement of suppliers at an early stage positively impacts the performance of humanitarian logistics.

2.3.3.2 Assessment accuracy

In relief operations, HOs mobilized resources based on the needs of the disaster-affected population. It would be easier to carry out a successful relief effort with accurate, complete, and timely information about the disaster's location, its severity, the damage caused, and the number of people affected (Azmat et al., 2019). It is necessary to collect data on the situation, people, and needs on hand because the response approach depends on the type and size of the disaster (Van Wassenhove, 2006; Beamon & Balcik, 2008; Rongier et al., 2010). Hence, the number of resources HOs get depends on the accuracy of the information (Davidson, 2006). Assessment accuracy determines the nature and extent of damage after a disaster by analyzing the number of goods and services required for response. Assessment must be taken seriously because estimation errors can have severe consequences for the continuation and reduce the effectiveness of the response (Rongier et al., 2010).

H2. Assessment accuracy has a positive impact on the performance of humanitarian logistics.

2.3.3.3 Degree of information sharing

The information sharing between HOs during the HSC operations is paramount for saving the affected people's lives due to the disaster (John et al., 2012). For successful emergency response, data interchange across humanitarian partners involved in disaster response operations is essential (Agarwal et al., 2022). Information sharing plays a vital role in the relief operation. Efficient delivery of relief items highly depends on the timely sharing of appropriate and relevant information to humanitarian actors in a response operation through advanced technology (Anjomshoae et al., 2017), even though infrastructures are destroyed in the disaster (Abidi et al., 2020). The size

of the affected population, including deaths and displaced, nature of aid materials required, magnitude and intensity of disaster, and access to areas and logistics hubs, e.g., airports and seaports, are relevant information during relief aid operations (Abidi et al., 2013). Without timely information sharing in post-disaster chaotic conditions, duplication of efforts and wastage of valuable resources are often the case (John et al., 2019). The 7Rs (right goods, right time, right place, right source, right cost, right condition, and right number) cannot be achieved without effective communication and collaboration throughout the supply chain (Shafiq & Soratana, 2020). Sharing timely and quality information helps to achieve resilience (De Farias et al., 2021).

H3. The degree of information sharing has a positive impact on the performance of humanitarian logistics.

2.3.3.4 Speed of delivery

While situational demands help to create a need for speed, another crucial element is how HOs perceive speed given their collective responses (Walton et al.,2011). Speed of delivery is a critical factor in HSC; hence it relates to beneficiaries' survival because delay in response is a matter of life and death, thus lead-time reduction becomes paramount (Anjomshoae et al., 2019). The available lead-time is always relatively short, and lead-time prediction is challenging (Khan et al., 2019). Speed of delivery measures how fast HOs can reach a disaster area; thus is an inherent and central characteristic of good disaster response. In relief operations, speed of delivery plays an important role and affects the ability of logisticians to procure, transport, and receive supplies in disaster-affected areas (Negi & Negi, 2021). Therefore, assessment accuracy and availability of data, choice of transport, procurement and delivery strategies, suppliers, and proximity of prepositioned relief items to disaster-prone areas are vital determinants in the speed of delivery facto (Kovács & Spens, 2007; Fernandes et al., 2016). As a result, whether a given logistics response is regarded as rapid or delayed depends much on how well the logistics team and the field requestors communicate (Walton et al., 2011).

H4. Speed of delivery has a positive impact on the performance of humanitarian logistics.

2.3.3.5 Quality & availability of relief items

Even though beneficiaries have limited control over the quality of assistance to receive (Balcik et al., 2016), relief operations aim to maintain human dignity. The quality of goods in a humanitarian supply chain is an essential criterion that stands for e.g., preventing the expiry date of products or standardization of the relief items (Abidi et al., 2013). Therefore, providing quality items starts with understanding the needs of victims. Hence to improve performance, it is central to identify the key features that determine the suitability of the product or services in the eyes of the customers, in this case, beneficiaries (Oakland, 2003). The availability of relief items describes the number of relief items delivered to beneficiaries in each type, group, and affected area in equitable and fair distribution. This indicates effectiveness in the relief operation because unfair distribution is a global phenomenon in humanitarian logistics (Khan et al., 2019). Furthermore, HSCs must choose the correct number and the most effective central and decentralized distribution centers to meet beneficiary demands (Abidi et al., 2020).

H5. The quality and availability of relief items positively impact the performance of humanitarian logistics.

2.3.3.6 Cost efficiency

The financial performance of a supply chain could be assessed by determining the total logistics cost (Gunasekaran et al., 2001). Cost is the predominant resource factor in commercial and humanitarian supply chains (Beamon & Balcik, 2008). It is associated with how much is required to operate the entire supply chain. Because logistics span functional boundaries, decision-making must be careful because the cost in one area influences the cost in others (Cavinato., 1992). Efficiency in management processes refers to the capacity to minimize waste, prevent redundancy and duplication of efforts, preserve energy, and maximize effort while reducing the time required and overall operational cost (Shafiq et al., 2021). As an essential measure of HSCM, the performance of the cost needs to be measured, managed, improved, and suitable metrics for it should be established. For instance, prepositioning reduces sourcing costs (Ghavamifar et al., 2022; John & Gurumurthy, 2022; Kord & Samouei, 2023). Nevertheless, a significant challenge in humanitarian logistics is monitoring supplies (Fernandes et al., 2016) and an effective and efficient transportation network

(Haghani & OH, 1996). Coordination mechanisms in procurement, warehousing, and transportation among HOs can also improve efficiency (Balcik et al., 2010; Duran et al., 2013; Lamenza et al., 2019).

H6. Cost efficiency has a positive impact on the performance of humanitarian logistics.

2.3.3.7 Community participation and trust

Community participation is essential for relief operations' success as it helps to build disaster response in local capacities. HOs must recognize communities' abilities to contribute collectively to all phases of disaster, thus gaining and maintaining community trust (Vahanvati & Mulligan, 2017). Anderson and Narus (1990), stated that trust is a favorable attitude when one supply chain member has confidence in another. The foundation of supply chain integration (SCI) is trust, since it must be built and earned before supply chain participants may integrate. In some instances, the complexity of the supply chain, adoption reluctance, the transparency issue, and a lack of SCI understanding led to inconsistent results (Talib et al., 2015b). As a result, for HOs to build trust with the HSC, they must engage in open and truthful operation practices. Local communities and those most affected by disasters need to be part of the dialogue because HOs need to replace siloed thinking with an all-society approach in an age of complex risk and escalating impacts (United Nation Office for Disaster Risk Reduction, 2022.). This reduces the dissemination of inaccurate information to the affected population (Maghsoudi & Pazirandeh, 2016). Moreover, community engagement fosters ownership, cultural sensitivity, and relevance of aid intervention. Thus, sharing resources and information can only occur in an environment that encourages learning and participation and where everyone feels comfortable expressing their ideas and thoughts (Kabra & Ramesh, 2015; Khan et al., 2019). Community support is provided for information dissemination, data collection, processing, and decision-making.

H7. Community participation and trust positively impact the performance of humanitarian logistics

2.3.3.8 Security of relief aids during distribution and transportation

The primary goal of security is to lessen the possibility of a terrorist attack by restricting unauthorized access to transport vehicles and increasing transparency in

logistics (Khan et al., 2019). HOs are willing to take risks to conduct their work. Security concerns the entire environment and the threats and vulnerabilities of humanitarian operations. Deployment of security during the transportation of relief aids and at the distribution center would reduce the risk of theft, sabotage, and crime, protecting products, equipment, facilities, and personnel, preventing the disclosure into the supply chain (SC) of unauthorized people, smuggling, or mass destruction of weapons and protect relief workers from threats (Khan et al., 2019). These difficulties not only jeopardize the safety of aid workers but also impede the delivery of vital supplies and relief to populations in need. Security protects resources and relief workers from a higher risk of a particular danger. Building a solid relationship between the security apparatus and communities and sharing security-related information in real time will improve efficiency, transparency, and trust in humanitarian logistics.

H8. Security of relief items during transportation and distribution positively impacts the performance of humanitarian logistics.

2.4 Performance Measurement

Efficiency in humanitarian logistics was critical to any relief aid operation's success (Dubey et al., 2015). HOs aiming to improve performance must react swiftly to the increasing unpredictability and complexity of disaster occurrences. For this to materialize, HOs must recognize and focus on their core competencies to serve more victims, thus saving the maximum number of lives. Under such circumstances, HOs must be agile, lean, and flexible in their supply chain network (Abidi et al., 2014; Dubey et al., 2015; Shafiq & Soratana, 2020a; Fernandes et al., 2016). To determine whether the supply chain network had achieved what it intended to, there was a need for performance measurement and management (Abidi et al., 2014). Performance management is quantifying an operation's effectiveness and efficiency (Neely et al., n.d.) Performance measurements were needed in a supply chain to simplify decision-making processes, streamline the movement of goods, information, and cash, and stop non-value-adding activities (Anand & Grover, 2015). Performance measuring systems enhance an organization's performance compared to organizations without them. Kaplan and Norton (n.d.) statement, "No measures, no improvement," supported this

assertion. According to Agami et al. (2012), performance metrics had high visibility within a business, and employees seek to perform well concerning them. Furthermore, (Whiting & Ayala-Öström, 2009) emphasized that a company that measured its performance was better equipped to acquire and hold onto information and quickly showed measurable and systematic advancements.

In HSCM, performance metrics and measurement tools are essential. It is necessary for assessing performance and providing direction for the organization's future actions, impacting the firm's strategic, tactical, and operational planning and control (Gunasekaran & Ngai, 2004). It can also helped allocate resources more effectively, assess the effectiveness of alternative approaches, and gain greater control over operations, even while allowing increased flexibility at the operating level; it can also improve transparency and accountability of disaster responses (Beamon & Balcik, 2008). Even though metrics on the performance of the relief supply chain have not received much attention (Bardhan & Dangi, 2016b), HOs had begun to recognize the need for empirical research to provide insights into performance measurement systems that incorporate pertinent financial and non-financial performance measures (Anjomshoae et al., 2022b). Because the goal of HOs was not just focusing on serving affected communities by providing them with relief services such as food, water, shelter, and medical items but also with reconstruction and social development to maintain human dignity following disasters (Shafiq & Soratana, 2020a). Hence, HOs must ensure effectiveness and efficiency in their supply chain for overall operational performance. However, 55% of HOs needed a performance measurement system, and of the 25% of HOs that were using some performance measurement indicators, only 20% continuously follow a consistent performance measurement system (Abidi et al., 2014). Additionally, even though HOs spend billions of dollars each year, a system needed to be put in place to monitor performance or the effects of aid on recipients (Goldschmidt & Kumar, 2016; Anjomshoae et al., 2019).

Researchers have proposed various performance indicators and frameworks to resolve this issue. Among the early works on performance measures in HSC included the thesis of Davidson (2006), who highlighted appeal coverage, donation to delivery time, financial efficiency, and assessment accuracy. Beamon and Balcik (2008) compared the performance measurement of HSC to a commercial supply chain and

proposed a three-component framework. The authors proposed resource performance, output performance, and flexibility as performance metrics for HSC. Besides, several researchers had adopted the balanced scorecard (BSC) and Supply Chain Operations Reference (SCOR) Model for the HSC sector (Schulz & Heigh, 2009; Schiffling & Piecyk, 2014; Lu et al., 2016; Anjomshoae et al., 2017, 2019). The BSC assesses performance from four angles: financial, learning and innovation, internal business processes, and customer. The SCOR model has five performance attributes, and all but asset management—reliability, responsiveness, agility, and cost are pertinent to HSC (Lu et al., 2016). Supply chain agility, supply chain adaptability, and supply chain alignment had been linked by Dubey et al. (2015) to improve HSC performance. Santarelli et al. (2015) developed an evaluation system to measure operational performance during disaster response and reconstruction projects. The authors presented performance evaluation indicators that were subdivided into five categories: Response time: project time, average response time, delivery date reliability, goods-to-delivery time, and presence of an organization's warehouse in location; reliability and flexibility: volume flexibility, mix flexibility and percentage of prepositioned goods; cooperation and standardization: degree of information sharing, degree of cooperation and degree of standardization; beneficiaries' and donors satisfaction, number of relief workers, percentage of people engaged in dispensing aid, total dollar spent, number of people helped, donor's auditing, spending capacity, and satisfaction level; cost performance: cost of goods, transportation cost, warehouse cost, percentage of claims, and percentage of goods not distributed. Most recently, Roh et al. (2022) identified reliability, responsiveness, cost, agility, and dialog with authorities as the most crucial performance indicators in HSC using literature and case studies in Taiwan. This research uses agility, leanness, and flexibility to measure performance in HL.

Agility primarily aimed to bring effectiveness to the overall operations by quickly responding to uncertain and unstable demand situations in an orderly and well-managed manner (Shafiq et al., 2021). Leanness implies improvement in the overall system of the supply chain with a focus on cost minimization, which is the same function as efficiency, and flexibility, which is a comprehensive notion, is a firm’s ability to adjust supply to match market demand in the face of uncertainty and variability (Anand & Grover, 2015). However, supply chain agility was thought to

include flexibility (Dubey et al., 2015). According to Dubey et al. (2015), agility in the supply chain enabled the network to recover from external pressures affecting delivery and service levels quickly. It helped to manage demand or supply uncertainty. In addition, the agile capabilities of supply chain networks enabled collaboration with third-party logistics and other supply chain actors to shorten lead times and enhance product or service delivery. Because responding quickly to a disaster is no longer sufficient but relatively sustainable and cost-effective, humanitarian operations required cost savings and waste reduction to enable HOs to serve more people in the affected communities (Shafiq & Soratana, 2020a). Shafiq et al. (2021) and Bealt et al., (2016) both highlighted that 40% of projected spending had been accounted for as being wasted due to duplication of efforts, redundant coordination and sequencing of exercises, lack of time to complete successful examinations, and excessive outcome-less effort. Hence leanness in HSC helps to improve the efficiency of activities in resource utilization and sustainability in both social and economic aspects (Shafiq & Soratana, 2020) considering the scarcity of resources. In a nutshell, the goal of humanitarian operations is ‘to do things right,' which is to attain value for money, to serve the maximum number of victims most cost-effectively and efficiently possible that is still commensurate with quality service.

Over the years, flexibility had gained importance not only in HSC but also in other fields of the supply chain, and it had been identified as a critical indicator in measuring HSC performance (Beamon & Balcik, 2008; Santarelli et al., 2015; Fernandes et al., 2016; Baharmand et al., 2019). Considering the unpredictability of demand and the high stakes associated with the timeliness of deliveries in HSCM (Beamon & Balcik, 2008), the flexibility metric relates to the ability of the HOs to change its supply chain according to external factors such as location, disaster type, and magnitude (Fernandes et al., 2016) and be able to respond efficiently to environmental, political, and operational challenges (Baharmand et al., 2019).

Accordingly, by recognizing the distinct characteristics and the volatile and complex to forecast demand in HL because of unpredictability and context of response. It is, therefore, crucial for the HO's supply chain network to be agile, lean, and flexible to respond and adapt to the uncertainties in the needs of affected communities.

Based on the literature review, the research framework is as follows.

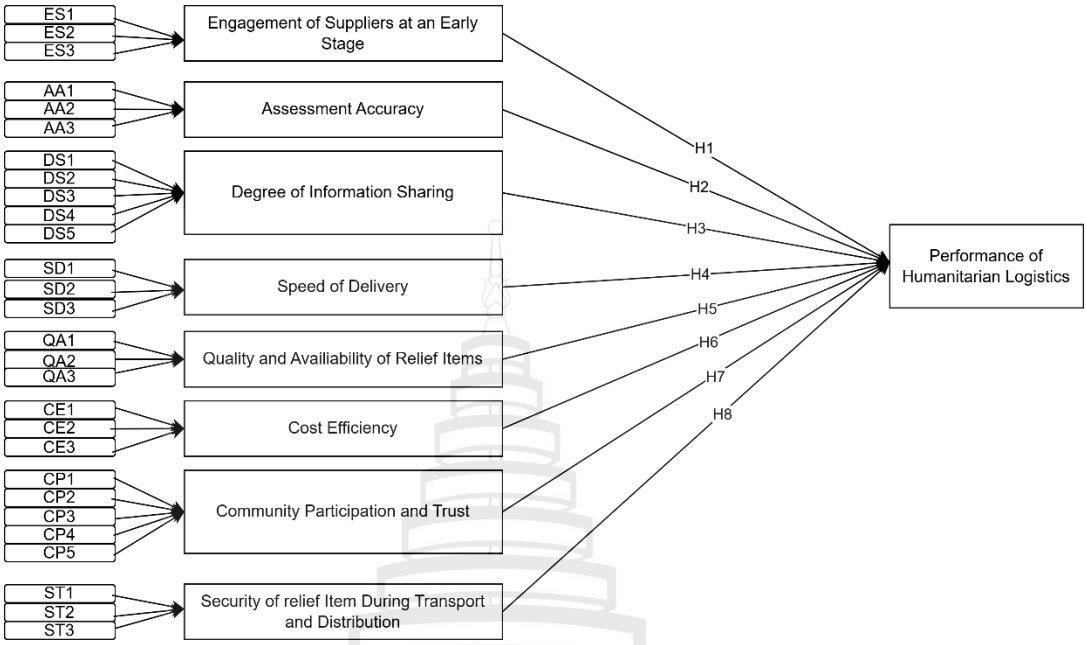


Figure 2.2 The Study Framework

This chapter has reviewed the literature on performance measurement in commercial and humanitarian supply chains, defined CSFs, and their relevance in SCM. CFSs in commercial supply chain management across various areas were identified and CSFs in the HLSCM were also highlighted. These CSFs for HL are classified into the three levels of management where they are more appropriate for decision-making. Finally, the study framework and hypothesis were discussed. The subsequent chapter will present and discuss the research methodology to investigate the proposed hypothesis.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Research Approach

The researcher selected a quantitative approach to explore the relationships between OCSFs of HSC and performance, to provide a conclusive result for the research questions, and to test the hypothesis. According to Atmowardoyo (2018), the quantitative approach could prove hypotheses to accept or reject a theory. Because the data to be analyzed are numerical, statistical formulas were used to establish links, variables, and hypotheses for supporting quantitative findings, and the researcher believes that the quantitative research approach is crucial (Neuman, 2006) This is significant since the study's primary goal is to evaluate the theory on the OCSFs for HSC.

Sensitivity and elasticity analysis are useful identification tools, but they are by no means sufficient, nor are they the only useful methods for identifying CSFs (Abidi et al., 2013b). Thus, environment scanning, industry structure analysis, opinions of experts in the industry, analysis of competitors, and analysis of the industry's dominant firm, a specific assessment of the company, intuitive judgments, and the profit impacts of market strategies as further analysis instruments (Abidi et al., 2013b). This study utilizes two stages to develop the conceptual framework. First, after a comprehensive review of the literature, a group of experts were identified to classify the CSFs into the three levels of strategic, tactical, and operational management. Second, because this research aimed to establish the relationship between OCSFs and performance of HL, a different group of experts were also selected to judge the items for each construct at the operational level.

A survey research design was employed after the two stages of developing the conceptual framework. This research design was appropriate where a large population geographically spread is involved (Erastus Kiswili et al., 2021b), which was the case in this study. The target population was people working in humanitarian aid organizations

conducting operations in Nigeria. These people are those with specific experience, knowledge, skills, or those exposed to a disaster event. Google questionnaires were used to obtain primary data for the study. Descriptive statistics were utilized to analyze the quantitative survey. The research employed SPSS 23 to facilitate the analysis of data. Inferential data analysis used the Pearson correlation coefficient and regression analysis to provide a clear summary and gain deeper insight into the data. Moreover, the Analysis of Variance (ANOVA) was utilized to examine the relationship between various OCSFs and the Performance of HL. ANOVA was also used to test the goodness of fit of the regression models and, finally, to test the hypothesis of the regression models. The massive practice has proved that the regression analysis method is an effective prediction method (Yuqing & Shuhang, 2008). Regression analysis, however, necessitates the manual selection of variables, which may reduce the precision of the correlation between the independent and dependent variables. For this reason, stepwise regression was usually utilized to choose the best set of predictor variables from a broader domain of variables. In this instance, the best refers to a combination of parsimony and adequacy of prediction (Henderson & Denison, 1989). With multiple stepwise regression analyses, we incorporate all potential influencing factors into the disposal plan and optimally select the independent variable with the most significant impact on the dependent variable.

3.2 Stage 1. Classification of CSFs

A comprehensive list of CSFs based on the literature review was developed. To learn from trustworthy and pertinent literature, it was crucial that researchers begin by analyzing the body of existing literature. A thorough literature review gives researchers guidance on what to look for, what gaps exist, and what is pertinent (Mouton, 2008). From relevant and reliable literature, a list included 19 CSFs was provided and subject matter experts were asked to classify them into the three levels of strategic, tactical, and operational management where fair decisions could be made. A panel of five experts were selected based on their level of management, experience, and knowledge. These managers were in the most appropriate position to shed light on what they consider strategic, tactical, and operational CSFs for HL. Nonetheless, the ideal number of

judges required to classify elements in the instrument must be considered when employing expert opinion. Although the rule “the more the better” is often recommended, there are several constraints preventing the use of large number of expert judges (Al-Shajarah, 2018).

Based on the literature review. experts were asked to state where each of the 19 CSFs would be more appropriate and to elaborate as to why this was the case.
Emails were sent to the experts inviting them to participate in the research as well as describing the research objectives. A definition of CSFs, strategic, tactical, and operational CSFs definitions were sent to clarify the research objectives.

3.3 Stage 2. Instrument Evaluation

Based on the outcome from stage 1, eight constructs Engagement of suppliers at an early stage (ES), Assessment accuracy (AA), Degree of information sharing (DS), Speed of delivery (SD), Quality and availability of relief items (QA), Cost efficiency (CE), Community participation and trust (CT), Security during transportation and distribution (ST), and Performance of logistics (PL) from the OCSFs were sent for evaluation in stage 2. The most addressed form of validation in test construction is content validation. Content validity refers to the degree to which elements of an assessment instrument are relevant to and representative of the targeted construct for a particular assessment purpose (Al-Shajarah, 2018).

A new panel of five experts with relevant training, experience, and qualifications relating to HLSCM were identified. A letter inviting them to participate in the research was sent. The letter included the aim of the research, the aim of the tool, and a description of the four dimensions of the scale (relevance, clarity, specificity, and depth). Furthermore, they were asked to evaluate these dimensions whether the items fitted in the assigned factors using (-1 = no; 0 = I am not sure; 1= yes) as well as any other comments they considered important. The aim of this stage is to engage with experts to validate the key dimensions of the construct (Sawitri et al., 2013). A general accepted value over 0.50 was considered (Al-Shajarah, 2018).

As indicated in table 3.1, the four dimensions showed a good content validity with scores over 0.60 exceeding the cut-off point of 0.50 suggested by Brown (1996).

Table 3.1 IOC Result

Item No.	Expert 1	Expert 2	Expert 3	Expert 4	Expert 5	IOC
1	1	1	1	1	1	1
2	1	0	1	1	1	0.8
3	1	1	1	1	1	1
4	1	1	1	1	1	1
5	1	1	1	1	1	1
6	1	0	1	1	1	0.8
7	1	1	1	1	1	1
8	1	1	1	1	1	1
9	1	-1	1	1	1	0.6
10	1	1	1	1	1	1
11	1	1	1	1	1	1
12	1	1	1	1	1	1
13	1	1	1	1	1	1
14	1	-1	1	1	1	0.6
15	1	0	1	1	1	0.8
16	1	1	1	1	1	1
17	1	-1	1	1	1	0.6
18	1	1	1	1	1	1
19	1	0	1	1	1	0.8
20	1	0	1	1	1	0.8
21	1	0	1	1	1	0.8
22	1	1	1	1	1	1
23	1	0	1	1	1	0.8
24	1	1	1	1	1	1
25	1	0	1	1	1	0.8
26	1	1	1	1	1	1
27	1	0	1	1	1	0.8
28	1	-1	1	1	1	0.6
29	1	1	1	1	1	1

Table 3.1 (continued)

Item No.	Expert 1	Expert 2	Expert 3	Expert 4	Expert 5	IOC
30	1	1	1	1	1	1
31	1	0	1	1	1	0.8
32	1	-1	1	1	1	0.6
33	1	0	1	1	1	0.8
34	1	1	1	1	1	1
35	1	-1	1	1	1	0.6

Source Authors own

Considering the experts opinions, slide changes were done; only 1 item was deleted. As a result, the final scale comprised 35 items. 3 items ES, 3 items AA, 5 items DS, 3 items SD, 3 items QA, 3 items CE, 5 items CT, 3 items ST, and 7 items PL.

3.4 Data Collection

3.4.1 Population and Sample Size

The selected sample were people with vast experience working in the humanitarian sector in Nigeria, providing relief services to refugees and disaster victims. However, the population in this sector cannot be determined. Thus, it is a challenge to announce the exact number. Following the James Stevens' sample size general rule of 15 cases per variable (Stevens, 2009), a total of 135 responses were required. Besides, several suggestions on the minimum sample size needed for regression have been recommended by various researchers. Rahman & Rahman, (2023) supported Tanaka 1987 ratio of a sample size to be as high as 20 to 1 or as low as 5 to 1. Dash and Paul (2021) proposed a minimum sample size of 200. A total of 278 responses were collected which falls within the acceptable range, it could be concluded that the sample size is therefore adequate to perform regression analysis.

3.4.2 Questionnaire Survey

Based on the research conceptual framework discussed in the literature review section, 8 constructs were determined as OCSFs for performance of HL. 29 items from

8 constructs were obtained from the literature and of which questioner was adapted. Data was collected using a Google Form question list. Using a Google form makes filling out survey forms quicker, simpler, and accessible to everyone without the need for in-person interaction. The utilization of online surveys presents an opportunity to gather substantial data in an economical, timely, and efficient manner (Regmi et al., 2016). Moreover, it is helpful for gathering information from populations that are difficult to reach as well as cross-country surveys (Regmi et al., 2016; Ooi et al., 2013). Besides, online surveys offer convenient and reliable data management. By design it protects against the loss of data and facilitates data transfer into a database for analysis (Regmi et al., 2016).

The questionnaires consist of two sections; section one addresses respondents' background information e.g., gender, age, education, experience, and position, and section two handle questions related to critical factors and performance in humanitarian logistic at the operational level on a 5-point "Likert" scale with 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, and 5 = Strongly Agree. Since the study aims to investigate the relationship between OCSFs and performance, the focus group would be those working at the lower level (frontliners) of HOs and often make decisions along the supply chain.

3.4.3 Questionnaires Pretesting

Questionnaire pretesting is a quick method to determine in advance whether a questionnaire causes issues for respondents or interviewers (Ikart, 2019). A pretest is essential to certify that all the questions are appropriate and that respondents can easily understand them. This claim is supported by Ikart (2019) and Wong (2002) when necessary; it serves as the basis for modifying the language structure of a specific query. Pretest also allows the researcher to check whether the language structure and the time provided for respondents to answer the questionnaires are adequate (Ooi et al., 2013). According to Ikart (2019) experts reviews are the common method to review questionnaires to provide a critique of the questions as a technique of spotting questionnaire problems, potential measurement errors or a breakdown in question answering process. To evaluate the content validity of the survey questionnaire, a draft version of the survey was pre-tested by both academicians and practitioners. The participants were

asked to assess the quality of the questionnaire in terms of its relevancy, clarity, specificity, and depth.

Although the items were adapted from the literature review, some items in the pretest were perceived by the experts as not clear. Thus, the clarity of these items was made accordingly which could have cause issues to respondents in answering the questions.

3.4.4 Pilot Test

A pilot study is an analysis intended to determine the feasibility of techniques and protocols for used on a larger scale in the future or to look for potential relationships and effects that could be worthwhile to investigate further in a more comprehensive study (Thabane et al., 2010). Pilot studies can assist in ensuring that the questions are sufficient and are arranged in a logical order, that the contents are comprehensive, and the instructions are adequate and clear, that the technology is feasible, that there are no skip patterns, and there are data compatibility or transfer issues, etc. (Regmi et al., 2016). Before launching the survey, a pilot test of questionnaires was necessary to authenticate the content. According to an African proverb attributed to the Ashanti people of Ghana, “You never test the depth of a river with both feet.” Similarly, the main objective of pilot studies is to determine feasibility to prevent potentially disastrous outcomes from starting a large study, which could potentially “drown” the entire research effort (Thabane et al., 2010). The pilot study findings were subjected to various types of reliability and validity test to measure the psychometric soundness and scales. Since the primary aim of pilot test is not hypothesis testing; nevertheless, to understand the feasibility of the study, the researcher used 30 respondents for the pilot test which was sufficient to run pilot test as it was suggest by Cooper and Schindler (2013) that a minimum number of respondents for pilot test could be 25.

3.5 Data Analysis

Data analysis according to (Nyile, 2023), is the process of applying logic to comprehend collected data in order to identify recurring trends and provide a summary

of pertinent information supported by the research. Since the study was quantitative, descriptive and inferential statistics were utilized.

3.5.1 Data Screening

The screening was conducted upon collecting data to check the assumptions' adequacy. Data screening ensures no outliers and that the responses' distribution does not violate the normalcy assumptions required for multivariate analysis and ensure that all responses entered are reliable and valid (Ooi et al., 2013). Moreover, skewness and kurtosis statistics were also evaluated to ascertain that they fall within the suitable values of – 3 and + 3 for skewness and -10 to +10 for kurtosis (Brown & Warschauer 2006).

3.5.2 Reliability and Validity

One of the prerequisites of any research process is the reliability of the data and findings. Therefore, according to Zohrabi (2013), reliability is concerned with the results obtained from a piece of research and includes consistency, dependability, and replicability. The dependability test is crucial since the researcher wants to check how much a test measures without error. (Zohrabi, 2013) suggested that the dependability of the result can be ensured using three techniques: the researcher's position, triangulation and audit trail. The reliability test evaluated the degree of consistency between various variable measurements (Hair et al., 2006). Reliability is related to whether the same results would be achieved when using the instruments to measure repeated things (Ooi, 2013). Also, it was employed to evaluate the internal consistency of the measurements used to support a particular construct or dimension (Hair et al., 2006). That means the scale's items or indicators should assess similar constructs and be highly correlated (Hair et al., 2006). Cronbach's alpha was utilized to substantiate the consistency of measurements in this study, and for it to be considered a good fit, the value should be 0.60 (Hair et al., 2006). Table 3.2 shows the factors and the sub-factors for the study

Table 3.2 Factors and Sub-Factors at Operational Level

Factors	Sub-factors	Purpose	Reference
Engagement of a supplier at an early stage	**ES1**: Procurement flexibility	Reduce the risk of shortage and overstocking	Ghavamifar et al. (2022), Liu et al. (2019), John and Gurumurthy (2022)
	ES2: Cost-effective	Cost efficiency improves overall disaster response.	Balcik et al. (2010), John and Gurumurthy (2022)
	ES3: Effective collaboration and coordination	Better coordination guarantees the supply of aid materials and quick delivery.	Balcik et al. (2010), John et al. (2019) Wankmüller and Reiner (2020), Kord and Samouei (2023)
Assessment accuracy	**AA1:** Understanding the issue	Accurate data enables Hos to understand the needs of beneficiaries and respond accordingly.	Rongier et al. (2010)
	AA2: Individualized solution	Goals and solutions reflect the disaster's specific nature, size, and magnitude.	Beamon and Balcik (2008), Tomasini and Van Wassenhove (2009), Rongier et al. (2010), Bealt et al. (2016)
	AA3: Resources	The number of resources HOs can get depends on the information being accurate.	Davidson (2006), Rongier et al. (2010), Larrea (2013)

Table 3.2 (Continued)

Factors	Sub-factors	Purpose	Reference
Degree of information sharing	**DS1:** Data exchange	Higher relationships provide capabilities to improve quality, reduce costs, and reduce disruption risks.	Akhtar et al. (2012), John et al. (2019), Agarwal et al. (2022)
	DS3: Advance technology	Enable timely sharing of appropriate and relevant information to humanitarian actors in a response operation.	Yadav and Barve (2015), Anjomshoae et al (2017), Damoah (2022), Behl et al (2019), Agarwal et al. (2022), Patil et al. (2022)
	DS4: Achieve the 7Rs	Ensures that the 7Rs (right goods, right time, right place, right source, right cost, right condition, and right quality) are achieved.	Makepeace et al. (2017), Shafiq and Soratana (2020)
	DS5: Achieve resilience	Sharing of timely and quality information helps to achieve resilience	Cardoso and Da Silva (2021)
Speed of delivery	**SD1:** Beneficiaries' survival	Allow Hos to quickly get to the disaster area to save more lives and alleviate suffering.	Davidson (2006), Tomasini and Van Wassenhove (2009), Abidi et al. (2013), Santarelli et al. (2015), Fernandes et al. (2016)

Table 3.2 (Continued)

Factors	Sub-factors	Purpose	Reference
	SD2: Lead-time reduction	Prompt response to affected areas saves more lives.	Santerelli et al. (2015), Fernandes et al. (2016), Abidi et al. (2013)
	SD3: Level of communication	Ensure close communication between the logistics team and the field requestors.	Walton et al. (2011)
Quality and availability of relief items	**QA1:** Understanding the needs	Identify critical features that determine the goods' suitability in the beneficiaries' eyes.	Oakland (2003)
	QA2: Equitable and fair distribution	Humanitarian assistance is a fundamental principle that should be enjoyed by all, regardless of race, sex, religion, political alignment, or nationality (neutrality)	Abidi et al. (2013),
	QA3: Distribution network configuration	Choosing the correct number and the most effective central and decentralized distribution centers to meet beneficiary demands	Abidi et al. (2020).

Table 3.2 (Continued)

Factors	Sub-factors	Purpose	Reference
Cost efficiency	**CE1:** Procurement cost	Assess the effects of costs of procurement strategies (as per-disaster inventory control) against a post-disaster acquisition.	Beamon and Balcik (2008), Abidi et al. (2013), Lu et al. (2016), Fernandes et al. (2016)
	CE2: Distribution cost	Assess the potential areas and specific transport means for each disaster type, aiming at reducing distribution costs.	Santarelli et al. (2015), Lu et al. (2016), Fernandes et al. (2016)
	CE3: Inventory cost	Assess the different types of costs related to stock maintenance.	Pettit and Beresford (2009), Fernandes et al. (2016), Lu et al. (2016)
Community participation and trust	**CP1:** Community engagement	Fosters ownership, cultural sensitivity, and relevance aid intervention	Vahanvati and Mulligan (2017) United Nation Office for Disaster Risk Reduction report (2022), Drakaki et al. (2023)
	CP2: Community Integration	Improves community resilient	United Nation Office for Disaster Risk Reduction report (2022)
	CP3: Mutual trust	Motivates free expression of views	Kabra et al. (2015), Khan et al. (2019)

Table 3.2 (Continued)

Factors	Sub-factors	Purpose	Reference
	CP4: Improve transparency	Enhance transparency in decision making and responsibility	Abidi et al. (2015), Cardoso and Da Silva (2021)
	CP5: Reduce the dissemination of inaccurate information	Reduces the dissemination of inaccurate information to the affected population	Chandes and Pache (2010), Maghsoudi and Pazirandeh (2016)
Security of relief items during transport and distribution	**ST1:** Increase trust	A better security situation will increase trust in Hos.	Khan et al. (2019)
	ST2: Ensure transparency	A better security situation will ease the process of transparency.	Khan et al. (2019)
	ST3: Prevent corruption	A better security prevent corruption in aid distribution	Khan et al. (2019)

3.5.3 Correlation and Analysis of Variance (ANOVA)

Correlation analysis is one of the most widely used and reported methods for summarizing scientific research data (Taylor, 1990). According to (Asuero et al., 2006a), correlation may be described as the degree of association between two variables. Taylor (1990) and Nyile (2023) argued that the correlation technique was applied when analyzing the degree of relationship between two variables. The correlation coefficient or r coefficient was a statistic used to measure the degree or strength of this type of relationship (Taylor, 1990). The correlation coefficient is often referred to as Pearson's product- moment. The statistical correlation coefficient produced by its computation ranges from value -1 to 0 to +1, where the values are absolute and nondimensional with no units involved. A positive value, for instance, +1, means that there is an essential relationship between two variables, or when one variable increases, the other also increases. A negative correlation indicates an inverse relationship where one variable increase and the other decreases. In contrast, a correlation coefficient of zero indicates that no relationship exists between the measured variables. Using Pearson's product moments correlation, the analysis was predicated on the idea that the data was normally distributed (Taylor, 1990; Nyile, 2023).

Furthermore, the study employs ANOVA to examine the relationship between various OCSFs. ANOVA is probably the most widely used statistical method for hypothesis testing currently in use (McHugh, 2011). Is a statistical tool that allows us to compare the null model and alternative models (Miller, 2002). The ANOVA is a statistical method used to detect differences between experimental groups. ANOVA is warranted in experimental designs with one dependent variable that is a continuous parametric numerical outcome measure, and multiple experimental groups within one or more independent variable (Sawyer, 2009). It compares the means of independent groups to determine whether there are statistically significant differences between them based on the F-statistics, which was calculated to determine if significant difference exist between the means of the groups. The F-test and the ANOVA give the overall significance of the regression test (Miller, 2002). An overall indicator of how well the equation predicts outcomes is the coefficient of multiple determination, or R^2. The alternative hypothesis, which comes into play if the Null hypothesis is rejected, asserts

that the group population means differ. The Null hypothesis is rejected when the p-value yielded by the t-test is < 0.05. The values in the two groups are assumed to be different from one another and to represent distinct populations when p-value < 0.05, indicating a statistically significant result (Sawyer, 2009)

3.5.4 Multiple Regression Analysis

Moreover, multiple regression analysis was utilized to examined the relationship between specified values of the independent variables and the dependent variable. Multiple linear regression is a generalization of simple linear regression in which there is more than one predictor variable (Marill & Lewis, 2002). It is used in the predetermination of the value of a variable based on the value of two or more other variables. In this study, the dependent variable is the performance of HL, whereas ES, AA, DS, SD, QA, CE, CP, and ST are the independent variables.

Since the correlation result provides only the direction and significance of the relationship between variables, regression analysis is done to examine the contribution of OCSFs to the Performance of HL and to assess the extent of the relationship between the independent and dependent variables of the study. According to (Nyile, 2023), explained by the model and the relative contribution of each of the predictors to the total variance explained. Multiple regression analysis is used to derive an equation that can be used to predict values of the dependent variable from several independent variables. Thus, is appropriate to utilize stepwise regression when there are several independent variables (Silhavy et al., 2017; Brown, 1993; Henderson & Denison, 1989). The stepwise regression technique's goal is to use as few independent variables as possible while maximizing estimating power (Silhavy et al., 2017). As most commonly defined, stepwise regression is a series of iterative search and model comparison techniques determining which independent variables—previously deemed somewhat significant—correlate strongly with the dependent variable (Henderson & Denison, 1989).The equation is of the general form.

$$yi = \beta 0 + \beta 1\ Xi1 + \beta 2\ Xi2 + \ldots + \beta p\ Xip + \varepsilon i,\ i = 1, \ldots n$$

where yi is the dependent variable, Xi1 … Xip are independent variables (predictors), β0 is an intercept, and β1 … βn are regression coefficients. The value of εii represents the error residuals.

The null hypothesis and alternative hypothesis for the regression are:

H0: There is no linear relationship between Y and the set of independent variables X1 to Xn

H1: There is a relationship between Y and the set of independent variables X1 to Xn.

In order to illustrate the data analysis that have been developed, a visual analysis framework is shown in figure 3.1.

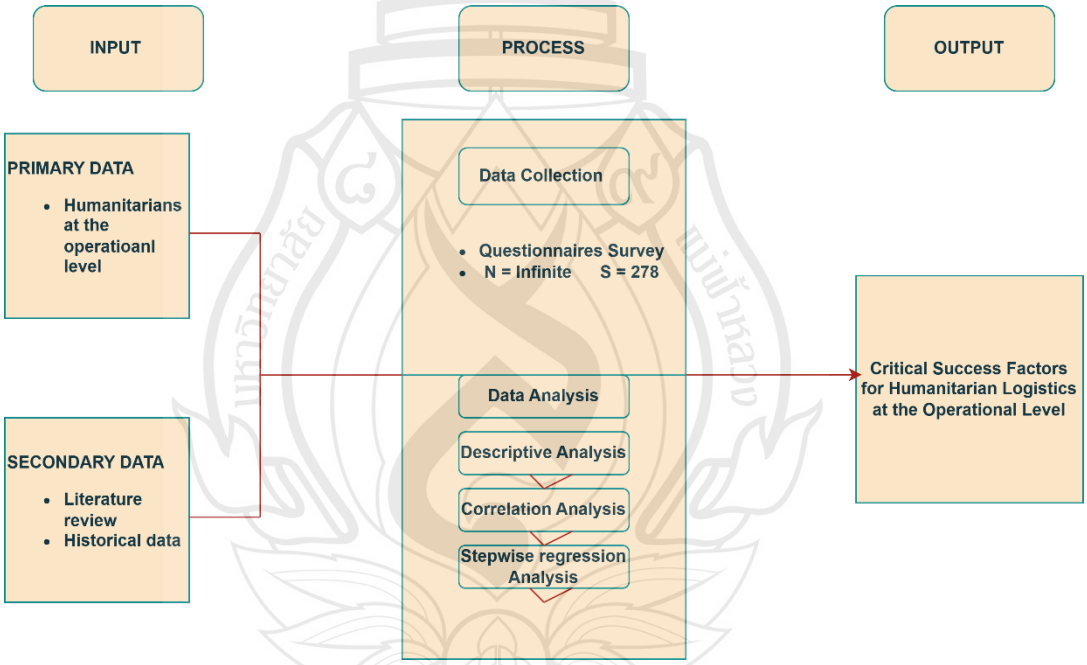


Figure 3.1 Analysis Framework

CHAPTER 4

DATA ANALYSIS AND INTERPRETATION

This chapter is divided into two sections. It starts with an explanation of the data cleaning process and the respondents' demographics details which entails their positions, type of institutions, age, gender, education level, and length of service. Whereas in the second section, a detailed description of the analyses undertaken to test the reliability and validity of the measures. This research used Cronbach's alpha values, to examine the reliability of the measures.

4.1 Data Screening

Analysis of data starts with data screening techniques. The result of the survey was extracted from the google questionnaires into the SPSS software for cleaning and further analyses. During the cleaning there were no input error since the data were inputs from the survey. No cases were identified as outliers based on the non-existence of substantial gaps in the Mahalanobis distances and hence none were discarded (De Maesschalck et al., 2000).

4.2 Demographic Profile

The profile of 276 respondents is illustrated in Table 4.1. it shows that most of the respondents are junior staff (44.9%), 18.8% are supervisor and the same for senior management and the rest are junior management. 60.9% of the total respondents are male compare to 39.1% female. In terms of age, a majority with 67.8% are within the range of 26-40 years followed by 20.3% above 40 years and 12% are 25 years or below. Majority of the respondents (51.8%) works with government institutions, 27.5% work with NGO's, 14.9% are with other type of institutions and only 5.8% works with UN systems. On the issue of the respondents' years of experience, 42% have less than five years working experience, 39.5% have 6 – 10 years' experience while the rest 18.5%

have more than 10 years of work experience in humanitarian institutions. From the perspective of their education level, 39.9% are Bachelor's degree holder, 28.3% are with Diploma, 22.1% are Master's degree holder, and 9.8% hold lower level. Based on this information, this research is able to identify several key characteristics of the respondents, namely majority are male with middle age and with some reasonably good education background and prefer to work with government institutions.

Table 4.3 Demographic Profile of Respondents

Demographic Variables	Frequency	Percentage
Job Position		
Junior staff	124	44.9
Supervisor	52	18.8
Junior management	48	17.4
Senior management	52	18.8
Sex		
Male	168	60.9
Female	108	39.1
Age		
25 or below	33	12
26 – 40 years	187	67.8
Above 40 years	56	20.3
Type of Institution		
Government	143	51.8
UN Systems	16	5.8
NGO's	76	27.5
Others	41	14.9
Years of Experience		
1-5 years	116	42
6-10 years	109	39.5
Above 10 years	51	18.5
Highest Level of Education		

Table 4.3 (continued)

Demographic Variables	Frequency	Percentage
Master's degree	61	22.1
Bachelor's degree	110	39.9
Diploma	78	28.3
Others	27	9.8

Source Authors' own

4.3 Descriptive Analysis of the Constructs

In order to assess the data normality, with regards to the CSFs and performance of logistics understudied, a descriptive analysis was performed. The study utilized the univariate data normality which is useful in developing a test of normality and in investigating the robustness of the standard normal theory (Mardia,1970). According to Nau (2016), a violation of normality can distort confidence intervals for forecasts and cause difficulties in determining the significance of model coefficient. A violation of normality distributed error terms can signal the existence of unusual data points or that the model can be improved. The mean, standard deviation, variance, skewness, kurtosis, minimum and maximum scores of each construct are listed in table 4.2. Based on the value of the mean score, the impact of each CSF construct is labeled as either high or low degree on performance in HL.

Table 4.2 reveals that the mean score for assessment accuracy (AA1) is the highest among the CSF constructs. This shows that respondents have more concern with understanding the needs of affected communities and the responses from the affected communities will enhance their performance. It will enable them to provide relief aid that will meet the needs of affected communities. The minimum and maximum values of assessment accuracy construct are 1 and 5 accordingly with standard deviation of 0.926. The mean value of cost efficiency (CE1) X = 3.87 is the lowest among all the CSF constructs, it may imply that HO's must be cost effective in their relief aid operations to improve performance

Table 4.4 Descriptive Statistics of the Constructs

	N	Minimum	Maximum	Mean	Std. Deviation	Variance	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
ES1	276	1	5	4.11	1.072	1.149	-1.549	.147	2.038	.292
ES2	276	1	5	4.22	.852	.726	-1.365	.147	2.371	.292
ES3	276	1	5	4.28	.793	.629	-1.194	.147	1.855	.292
AA1	276	1	5	4.31	.929	.863	-1.674	.147	3.039	.292
AA2	276	1	5	4.29	.841	.707	-1.358	.147	2.143	.292
AA3	276	1	5	4.26	.837	.701	-1.264	.147	1.912	.292
DS1	276	1	5	4.26	.842	.708	-1.328	.147	2.279	.292
DS2	276	1	5	4.22	.790	.624	-1.217	.147	2.382	.292
DS3	276	1	5	4.25	.845	.714	-1.421	.147	2.764	.292
DS4	276	1	5	4.29	.787	.620	-1.365	.147	2.810	.292
DS5	276	1	5	4.24	.874	.764	-1.472	.147	2.779	.292
SD1	276	1	5	4.26	.901	.812	-1.621	.147	3.235	.292
SD2	276	1	5	4.12	.888	.789	-1.052	.147	1.039	.292
SD3	276	1	5	4.03	.846	.716	-.919	.147	1.115	.292
QA1	276	1	5	3.98	.904	.818	-1.093	.147	1.593	.292
QA2	276	1	5	4.04	1.047	1.096	-1.064	.147	.556	.292

Table 4.2 (continued)

	N	Minimum	Maximum	Mean	Std. Deviation	Variance	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
CE1	276	1	5	3.87	.930	.866	-1.149	.147	1.658	.292
CE2	276	1	5	3.92	.940	.884	-1.049	.147	1.131	.292
CE3	276	1	5	3.96	.920	.846	-1.023	.147	1.167	.292
CP1	276	1	5	4.22	.906	.820	-1.280	.147	1.707	.292
CP2	276	1	5	4.29	.845	.714	-1.567	.147	3.410	.292
CP3	276	1	5	4.29	.819	.671	-1.413	.147	2.795	.292
CP4	276	1	5	4.25	.895	.801	-1.626	.147	3.193	.292
PL3	276	1	5	4.02	.831	.690	-.807	.147	.775	.292
PL4	276	1	5	3.78	.940	.883	-.585	.147	-.123	.292
PL5	276	1	5	3.86	.912	.832	-.824	.147	.801	.292
PL6	276	1	5	3.84	.972	.944	-.937	.147	.820	.292
PL7	276	1	5	3.85	1.011	1.021	-.997	.147	.809	.292

Valid N (listwise) 276

Source Authors' Own

The standard deviations, skewness and kurtosis for all variables are between the threshold of ±2, ±1 and ±3 for standard deviation, skewness and kurtosis respectively (Blanca et al., 2013; Maghsoudi & Pazirandeh, 2016). Therefore, non-normality of data was not an issue for the research.

4.4 Reliability and Validity Test

For researchers to ensure that the measurement models in their research capture what they intend to measure, reliability and validity test must be carried out. In fact, Ab Hamid et al. (2017) mentioned that the assessment of reflective outer model involves the examining of reliabilities of the individual items, reliability of latent variables, internal consistency (Cronbach alpha and composite reliability), construct validity (loading and cross-loading) convergent validity (average variance extracted, (AVE) and discriminant validity (Fornell-Larcker criterion, cross loading, HTMT criterion). The significance of validity and reliability in data collection and instrument development was highlighted by (Golafshani, 2003). He underlined that the extent to which result was consistent over time and an accurate representation of the overall population under investigation is referred to as reliability and if the outcome of a study can be reproduced under a comparable methodology, the research instrument is regarded to be reliable. Fitzner (2007) actually said that when instruments are valid and reliable, there is less reason to worry about bias and distortion in measuring results.

The most common measurement used for internal consistency is Cronbach alpha and composite reliability with values between 0.60 to 0.70 are acceptable according to (Ab Hamid et al., 2017; Hair et al., 1998). Voorhees et al. (2016) defined validity as the degree to which instruments truly measure the construct which they are intended to measure.

The rule of thumb of (Nunnally, 1978), also support the notion that the value of Cronbach's Alpha is acceptable when it is greater than .06 for internal consistency for exploratory research. Thus, Cronbach's Alpha was used to validate the reliability of the psychometric test score in this research. The Cronbach's Alpha values as shown in table 4.3 of all factors were estimated using SPSS V 23.

Table 4.5 Reliability of Indicators

Factors	Indicators	Cronbach's Alpha
ES	ES1	.742
	ES2	
	ES3	
AA	AA1	.717
	AA2	
	AA3	
DS	DS1	.794
	DS2	
	DS3	
	DS4	
	DS5	
SD	SD1	.699
	SD2	
	SD3	
QA	QA1	.748
	QA2	
	QA3	
CE	CE1	.743
	CE2	
	CE3	
CP	CP1	.773
	CP2	
	CP3	
	CP4	
	CP5	
ST	ST1	.772
	ST2	
	ST3	

Table 4.5 (continued)

Factors	Indicators	Cronbach's Alpha
PL	PL1	.805
	PL2	
	PL3	
	PL4	
	PL5	
	PL6	
	PL7	

Source Authors' own

The results show that Cronbach's Alpha coefficient scores for all factors are greater than .06 for exploratory research. Therefore, the results demonstrate good reliability of internal consistency.

To estimate the true worth of the measuring tool, validity (Reddy & Kulshrestha, 2019), the researchers used the KMO test and the Bartlett's test of Sphericity. This test analyzed whether the responses given are adequate with the sample or not. The acceptable KMO value is between 0.6 and 1 (Reddy & Kulshrestha, 2019; Ooi, 2013). The result in table 4.4 shows that the KMO measure of sampling adequacy value for all items were greater than .60, with most in the range of 0.630 to 0.839 indicating adequate inter-correlations while the Bartlett's test of sphericity was large and significant for all of the factor analyses, with value ranging from 158.008 to 510.563. Additionally, the Bartlett's Test of Sphericity's significance value (p) for each item is 0.000, < 0.001. As a result, the identity matrix differs from the correlation matrix. This shows how strongly the variables are related to one another.

Table 4.6 KMO and Bartlett's test of Sphericity

Factors	Indicators	KMO values	Bartlett's test of sphericity values
ES	ES1	0.692	190.626
	ES2		

Table 4.4 (continued)

Factors	Indicators	KMO values	Bartlett's test of sphericity values
	ES3		
AA	AA1	0.658	167.652
	AA2		
	AA3		
DS	DS1	0.805	376.426
	DS2		
	DS3		
	DS4		
	DS5		
SD	SD1	0.630	158.008
	SD2		
	SD3		
QA	QA1	0.665	199.904
	QA2		
	QA3		
CE	CE1	0.687	183.496
	CE2		
	CE3		
CP	CP1	0.793	330.061
	CP2		
	CP3		
	CP4		
	CP5		
ST	ST1	0.697	217.988
	ST2		
	ST3		

Table 4.7 (continued)

Factors	Indicators	KMO values	Bartlett's test of sphericity values
PL	PL1	0.839	510.563
	PL2		
	PL3		
	PL4		
	PL5		
	PL6		
	PL7		

Source Authors' own

4.5 Correlation Analysis

Correlation analysis aids in identifying the relationship between variables by given insight on the strength and direction of relationship (Dancey and Reidy 2007). It is essentially a tool for determining how a collection of variables relates, thereby facilitating the test for multicollinearity (Nyile, 2023). The values of the coefficient of correlation could be anywhere between -1 and +1, with the signs indicating the direction of connection. The absence of a relationship between variables is indicated by a correction value of 0, a weak relationship is indicated by a result between 0.1 and 0.3, moderate and strong relationships are indicated by results between 0.4 and 0.6 and a perfect relationship is indicated by a correlation coefficient of 1 (Dancey & Reidy 2007).

According to the conceptual model, based on the theory derived from the existing literature, it is hypothesized that the conceptual model of CSFs positively influences performance in HL. The research hypothesis presumes a positive relationship, thus right-tailed test is appropriate (Cho & Abe, 2013). In other words, the two tailed test showcases the correlation of every variable with each other variable. As shown in table 4.4, the Pearson correlation coefficient was found to be statistically

significant for all variables at the 0.05 level of significance (Reddy & Kulshrestha, 2019). This shows that the problem of multicollinearity does not exist.

Security of relief items during transport and distribution (ST) shows the highest positive Pearson correlation coefficient of 0.575 as shown in table 4.5, while cost efficiency (CE) and quality and availability (QA) are 0.536 and 0.531 respectively. One tailed significant is significant for ST, CE and QA. Therefore, ST correlates best with outcome ($R=0.872$, $p<0.001$), CE ($R=0.536$, $p<0.001$) and QA ($R=0.531$, $p<0.001$) and so it is likely that these variables will best predict performance of HL. From table 4.6, the correlation between ST and performance of HL is 0.575 and thus it accounted for 33.1% of variability of outcome, CE and performance of HL have a correlation of 0.635 and accounts for 40.3% while QA have a correlation of 0.648 with variability outcome of 42.0%.

Table 4.8 Pearson Correlation Coefficient

		ES_Mean	AA_Mean	DS_Mean	SD_Mean	QA_Mean	CE_Mean	CP_Mean	ST_Mean	PL_Mean
ES_Mean	Pearson Correlation	1								
	Sig. (2-tailed)									
AA_Mean	Pearson Correlation	.658**	1							
	Sig. (2-tailed)	.000								
DS_Mean	Pearson Correlation	.650**	.694**	1						
	Sig. (2-tailed)	.000	.000							
SD_Mean	Pearson Correlation	.634**	.631**	.693**	1					
	Sig. (2-tailed)	.000	.000	.000						
QA_Mean	Pearson Correlation	.573**	.529**	.608**	.657**	1				
	Sig. (2-tailed)	.000	.000	.000	.000					
CE_Mean	Pearson Correlation	.553**	.499**	.608**	.663**	.645**	1			
	Sig. (2-tailed)	.000	.000	.000	.000	.000				
CP_Mean	Pearson Correlation	.560**	.589**	.611**	.599**	.533**	.530**	1		
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000			
ST_Mean	Pearson Correlation	.491**	.440**	.540**	.567**	.575**	.537**	.599**	1	
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000		
PL_Mean	Pearson Correlation	.407**	.389**	.441**	.512**	.531**	.536**	.448**	.575**	1

Table 4.9 (continued)

		ES_Mean	AA_Mean	DS_Mean	SD_Mean	QA_Mean	CE_Mean	CP_Mean	ST_Mean	PL_Mean
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000	

Note **. Correlation is significant at the 0.01 level (2-tailed).
N=276

Source Authors' own

4.6 Stepwise Regression Analysis Model

The research utilized stepwise multiple regression to establish the linear statistical relationship between independent and dependent variables of this study. Unlike correlation, the primary purpose of regression is prediction (Marczyk et al., 2005). The model summary for each variable shows the correlation (R), regression (R^2), and adjusted R^2. It also indicates the fitness of the model (F), degree of freedom, and the significance value (p value < 0.05) and lastly the t-values (± 1.96) critical values with a 95 percent confidence interval which basically tells whether the hypothesis is accepted or rejected. The stepwise regression explores a number of alternative models, with variables being either added or dropped in the process, depending on how important they appear to be statistically. Usually, variables are added to maximize the coefficient of determination, R^2, or equivalently, minimize the error sum of squares. Statistically, the goodness-of-fit for the model was also assessed utilizing the coefficient of determination (R^2), which shows the amount of variance in the dependent variable explained by the independent variables. The eight hypotheses as stated in the study were tested using stepwise regression models.

Table 4.6, the ANOVA table, tests the model's acceptability from a statistical perspective. The regression row shows information about the variation accounted for by the model, while the residual row shows information about the variation not accounted for by the model. In Model 1, the regression sum of squares shows 39.040, which implies that the model accounts for 39.04% of the variation. For model 2, when cost efficiency was added to the model, the variation accounted for by the model increased to 47.63%, and in the best fits model 3, the combination of quality and availability of relief items, the variation accounted for by the model increased to 49.63%. This implies that besides the security of relief items during transport and distribution, cost efficiency, quality and availability are strong predictors of HL's performance. The significant value of the F statistics is <0.05, which indicates that the variation explained by the model is not by chance ($p<0.001$). For model 3, which is the best fit, with the combination of cost efficiency and quality and availability of relief items, the F value shows F=65.722, which shows that the model is significant.

Table 4.10 ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	39.040	1	39.040	135.302	.000[b]
	Residual	79.061	274	.289		
	Total	118.10	275			
2	Regression	47.633	2	23.816	92.267	.000[c]
	Residual	70.468	273	.258		
	Total	118.10	275			
3	Regression	49.632	3	16.544	65.722	.000[d]
	Residual	68.469	272	.252		
	Total	118.10	275			

Note a. Dependent Variable: PL_Mean

b. Predictors: (Constant), ST_Mean

c. Predictors: (Constant), ST_Mean, CE_Mean

d. Predictors: (Constant), ST_Mean, CE_Mean, QA_Mean

The model summary in table 4.7 shows that the value of R^2 is 0.331(model 1) which indicates that there are 33.1% (R= 0.575) changes in dependent variable (performance of HL). This explains that security of relief items during transport and distribution is a crucial factor to the performance of HL. The value of R^2 is 0.403 (R=0.635) for model 2 shows that there are 40.3% changes in dependent variable performance of HL when changes in combination of two independent variables security of relief items during transport and distribution and cost efficiency. In model 3, the R^2 value is 0.420 (R=0.648) which shows that there are 42.0% changes in the dependent variable when changes in combination of three independent variables security of relief items during transport and distribution and cost efficiency and quality and availability of relief items. By comparing the three models, Model 3 is a better model fit to the data than both model 1 and 2. This is because the higher the value of R^2 and adjusted R^2

(model 1= 0.328, model 2= 0.399, model 3 = 0.414), the better the model fits to the data (Akinbinu, 2010)

Table 4.11 Model Summary

Model	R	R^2	Adjusted R^2	Std. Error of the Estimate
1	.575[a]	.331	.328	.53716
2	.635[b]	.403	.399	.50806
3	.648[c]	.420	.414	.50172

Note a. Predictors: (Constant), ST_Mean

b. Predictors: (Constant), ST_Mean, CE_Mean

c. Predictors: (Constant), ST_Mean, CE_Mean, QA_Mean

The Adjusted R^2 value on the model summary table is a representation of the correlation between the observed values of the dependent variable predicted by the regression models. According to Chandan et al. (2011), a large value of the Adjusted R^2 represents a larger correlation between the predicted and observed values of the dependent variable. However, Asuero et al. (2006) emphasized that the correlation coefficient, r, is a standardized index for which the value does not depend on the measurement scales of the variables. The authors highlighted that its values lie in the range (-1,1) and its squared value describes the proportional reduction in variability of one variable when the other is held constant. As clearly showed on the model summary table 4.7, the adjusted R^2 in model 3 is 0.414, this suggest that 41.4% of variation in the model is explained by the variables already captured into the model. Thus, 0.420 R^2 value revealed that 41.4% of the variation in performance of HL explained by the variables existed in the model. Therefore, only 58.6% of the variation in the dependent variable is to be determined by the variables outside of this model. The study findings indicate that engagement of suppliers at an early-stage, assessment accuracy, degree of information sharing, speed of delivery, quality and availability of relief items, cost efficiency, community participation and trust, and security of relief items during

transport and distribution are jointly positively related with performance of HL as indicated by Pearson Correlation R, value of 0.648.

Moreover, the model summary table shows that 42.0% of change in performance of HL can be explained by eight predictors namely engagement of suppliers at an early-stage, assessment accuracy, degree of information sharing, speed of delivery, quality and availability of relief items, cost efficiency, community participation and trust, and security of relief items during transport and distribution.

From table 4.8, the model equation that best predicts the outcome which is model 3 can be describe by the equation below:

Performance of HL= 1.175+.305security of relief items during transport and distribution +.203cost efficient +.149quality and availability of relief items

From this model we could see that security of relief items during transport and distribution has more strength in predicting the outcome. The standard error for predictors is zero while it is 0.191for model equation constant. The t-statistics have positive values with significant values <0.05 indicating significant contribution to the model.

Table 4.12 Coefficient correlation

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	**Std. Error**	**Beta**	**t**	**Sig.**
1	(Constant)	1.731	.183		9.456	.000
	ST_Mean	.509	.044	.575	11.632	.000
2	(Constant)	1.272	.191		6.675	.000
	ST_Mean	.357	.049	.403	7.275	.000
	CE_Mean	.277	.048	.320	5.770	.000
3	(Constant)	1.175	.191		6.147	.000
	ST_Mean	.305	.052	.345	5.893	.000
	CE_Mean	.203	.054	.234	3.727	.000
	QA_Mean	.149	.053	.182	2.818	.005

Note a. Dependent Variable: PL_Mean

Further, out of the eight variables, only three variables security of relief items during transport and distribution, cost efficiency, and quality and availability have a positive and significant relationship with performance of HL. This implies that an increase in any of these factors results to an improvement in performance of HL. The regression coefficient for security of relief items during transport and distribution was positive and significant ($\beta 1 = 0.305$, $p<0.05$), with a t-value of 5.893. This implies that for every unit increase in security of relief items during transport and distribution, performance of HL is predicted to increase by 0.305 units.

The regression coefficient for the construct cost efficiency was positively significant ($\beta 1 = 0.203$, $p<0.05$), with a t-value of 3.727. This suggests that HL's performance is expected to increase by 0.203 units for every unit increase in cost efficiency. Lastly, the determination coefficient for quality and availability of relief was also positive and significant ($\beta 1 = 0.149$, $p<0.05$), with a t-value of 2.818. This implies

that HL performance is expected to rise by 0.149 units for every unit increase in the quality and availability of relief items.

In the proposed model (figure 2.2), H1, H2, H3, H4 and H7 depicted the relationship that engagement of suppliers at an early-stage (ES), assessment accuracy (AA), degree of information sharing (DS), speed of delivery (SD) and community participation and trust (CP) respectively results in improving the performance of HL. As indicated in table 4.9, the summary of the excluded variables in the models 1, 2 and 3 and estimates each predictor's beta value as it was used in the equation and calculates a t-test for this value. The effect of engagement of suppliers at an early-stage is not in the hypothesized direction and it was statistically insignificant which does not support H1. In H2, it was stated that assessment accuracy improves performance of HL, but H2 is rejected. H3 predicted that high degree of information sharing helps in improving the performance of HL. As output shows, the effects of degree of information sharing are not in the hypothesized direction and it was statistically insignificant. In H4, the speed of delivery and H7, community participation and trust were all attached to improved performance of HL. However, they were all rejected.

Table 4.13 Excluded Variables

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics Tolerance
1	ES_Mean	.165[b]	2.953	.003	.176	.759
	AA_Mean	.169[b]	3.115	.002	.185	.807
	DS_Mean	.184[b]	3.184	.002	.189	.708
	SD_Mean	.275[b]	4.759	.000	.277	.679
	QA_Mean	.299[b]	5.188	.000	.300	.670
	CE_Mean	.320[b]	5.770	.000	.330	.712
	CP_Mean	.161[b]	2.638	.009	.158	.642

Table 4.14 (continued)

	Model	Beta In	t	Sig.	Partial Correlation	Collinearity Statistics Tolerance
2	ES_Mean	.051[c]	.877	.381	.053	.642
	AA_Mean	.073[c]	1.321	.187	.080	.709
	DS_Mean	.051[c]	.817	.414	.049	.567
	SD_Mean	.145[c]	2.197	.029	.132	.498
	QA_Mean	.182[c]	2.818	.005	.168	.511
	CP_Mean	.063[c]	1.032	.303	.062	.581
3	ES_Mean	.008[d]	.136	.892	.008	.595
	AA_Mean	.037[d]	.645	.519	.039	.664
	DS_Mean	.004[d]	.056	.955	.003	.524
	SD_Mean	.095[d]	1.382	.168	.084	.447
	CP_Mean	.036[d]	.585	.559	.036	.565

Note a. Dependent Variable: PL_Mean

b. Predictors in the Model: (Constant), ST_Mean

c. Predictors in the Model: (Constant), ST_Mean, CE_Mean

d. Predictors in the Model: (Constant), ST_Mean, CE_Mean, QA_Mean

CHAPTER 5

DISCUSSION AND CONCLUSIONS

5.1 Discussion

This research achieved validation of the nature of the success factor in HL by exploring the relationship between OCSF and performance in relief aid operation. Three of the CSFs, quality and availability of relief items, cost efficiency and security of relief items during transport and distribution was found to positively contribute to successful relief aid operation, while the remaining five CSFs engagement of suppliers at an early stage, assessment accuracy, degree of information sharing, speed of delivery, and community participation and trust demonstrated an insignificant impact on relief aid operation success.

The result shows that engagement of suppliers at an early stage has no effect on performance of HL. Our research outcomes are inconsistent with the result of Wankmüller & Reiner, (2021) and Lamenza et al. (2019). Their studies suggested that, embracing suppliers at the preparation phase could offer a promising avenue for successful procurement processes, thus strengthening the overall response capacity, improving efficiency, and enhancing the ability to meet the needs of affected populations effectively. Moreover, our finding does not concord with the work done by Balcik et al. (2010), John et al. (2022) and John and Gurumurthy (2022) who emphasized that establishing relationships early with suppliers ensure reliable partners, procurement flexibility, secure commitments, and facilitates collaboration, information sharing, and effective coordination. Our findings contradict with the result of (Ertem & Buyurgan, 2013) which suggest early engagement ensures that suppliers understand the quality requirements, leading to fewer issues with substandard or non-compliant products during crises. As could be seen from the literature, suppliers should to be involved in the planning stage to foster partnerships, optimizes logistics process, and ultimately enhance speed, cost-efficiency and resilience of humanitarian relief operations.

Next to engagement of suppliers at an early stage is assessment accuracy. Assessment accuracy has been illustrated to affect performance of HL. The finding of our study was inconsistent to the work of (Yadav & Barve, 2015). Even though their work revealed that assessment accuracy has a weak driving power and a strong dependence and was the outcome kind of CSF. Their findings were in line with Bardhan and Dangi (2016b) who emphasized that assessment accuracy enable logisticians to understand the impact of a disaster, how the impact affects the population and how the logistics services are to be provided. Previous research by (Abidi et al., 2013b, 2015) and (Davidson, 2006) also validates the findings from (Bardhan & Dangi, 2016b) that assessment accuracy is critical to performance of relief aid operation because the number of goods or donations HOs could mobilize depends on the information be accurate.

Thirdly, it was revealed that our result indicates that degree of information sharing has a negative influence in improving performance of relief aid operation. In other words, the more information is shared between HOs, the less impact it has on relief aid operation. Our research result is uneven with the study of (Anjomshoae et al., 2017) who concluded that the prompt dissemination of pertinent information to humanitarian actors participating in a response operation using cutting-edge technology is crucial to the effective delivery of relief supplies. However, our findings could be attributed to the behavioral theory which emphasized that an actor's behavior might be a result of previous experience with emergency situations, which might have an impact on information sharing approaches, and this could build or lower confidence depending on the prior experience (Modgil et al., 2022). The study of John et al. (2019) also support Anjomshoae et al. (2017) where in the chaotic post-disaster environment, it is frequently the case that important resources are wasted and efforts are duplicated when timely information sharing is lacking. Our research findings also contradict with the research conducted by De Farias et al. (2021a) who highlighted that sharing timely and quality information helps to achieve resilience. Information sharing may improve performance by reducing overall costs and raising service quality (Najjar et al., 2019). According to the authors' findings, refugees' assessments of the services provided by their aid providers were impacted by information sharing in both direct and indirect ways, depending on the quality of the information. Through the review of the literature,

research have shown that information sharing was critical in establishing coordination and effective decision-making processes for a HL response. Better coordination and decision-making would lead to improved response for beneficiaries as a result of timely and high-quality information received by HOs. Thus, HOs should allocate their resources efficiently to take advantage of coordination to enhance information sharing. To be successful, HOs, especially front liners who deal with the affected population, are required to share relevant information between actors involved in providing relief aid. This would prevent the duplication of efforts, delays in response time, and inefficient allocation of resources. Furthermore, because disaster events are usually complex, dynamic, and ever-changing, information sharing prevents disaster escalation and lowers failures and casualties (Dominika Kamrowska-Zaluska et al., n.d.).

The finding from our empirical research indicates that speed of delivery is not also a critical determinant of relief aid operation. However, according to (Walton et al., 2011) leading disaster response communities used languages such as immediate actions to save live, rapid response, and actions should be cared out rapidly and as soon as possible to emphasized the importance of speed in relief operation. Thus, our research findings contradict the conclusions of the leading disaster response communities. The fact that standards and mission-based guidelines do not generally define speed may be the reason for our findings. Walton et al. (2011) noted that little attention is paid to what might be deemed slow, or the opposite of too fast, which could be seen with hurried evaluation and decision-making. Notwithstanding, Russell (2005) and Kovács and Spens (2007) argued that the speed of relief aid depends on the ability of logisticians to procure, transport, receive, and distribute supplies to the affected communities. Our research result has been found to be inconsistent with the study of (Fahimnia et al., 2017) who designed a supply chain model for the efficient and effective supply of blood in disasters, emphasized that one of the key elements influencing the success of relief efforts is the prompt delivery of aid supplies.

When HOs have a clear understanding of the needs of the affected population, this is when relief aid operation's success begins. Hence, the findings in our research have revealed it as the case. With an appropriate knowledge of victim's needs; HOs could identify the key features that determine the suitability of the good or services in the eyes of beneficiaries (Oakland, 2003). Hence, the findings from our study concluded

that quality and availability positively impact performance. In the commercial supply chain, quality, according to Sila et al. (2006), is a crucial component of the value-adding process that goes into the manufacturing and distribution of goods along the supply chain. The authors went on to say that maintaining quality initiatives along the entire chain has important implication for cost reduction. The difficulties of today's competitive market and ever-more-demanding customers, who are vying for limited resources, are not unique to HOs (Mahmoud et al., 2019). To this end, providing high quality relief items improves efficiency of operations, thus supports accountability to both customers (donors and beneficiaries). Similarly, donors want to know how funds are being spent, and HOs are committed to accountability, as well as efficient and effective practices (Larson & Foropon, 2018). Our findings were also consistent to those of (Mahmoud et al., 2019) who noted that the beneficiary's satisfaction is not only measured by the quality of assistance but also by how they receive this assistance, which means that the process and system followed by the organization are important in satisfying the beneficiaries. The availability of relief items refers to the quantity of relief items that are distributed fairly and equally to beneficiaries. In relief aid operation, the mode of transport and location of distribution points must be examined when considering availability. The features of the various modes vary greatly, and they would satisfy the requirements for cost, speed, and dependability quite differently. According to Mishra et al. (2022) finding the optimum transportation routes were also useful for the relief distribution in disaster environments as the optimum transportation routes had been advantageous in terms of minimization of travel time and associated operational cost. It was noted in (Beamon & Balcik, 2008) that location of distribution centers and the amount of relief suppliers to be stored considering quick-onset disaster improve performance in aid operations.

The initial conclusion that could be derived from this research was that cost efficiency being one of the CSFs, has demonstrated a significant impact on performance of HL. Our research outcomes are consistent with (Liu et al., 2021) work which suggests that cost efficiency ensure a satisfactory service level. Furthermore, our findings correspond with the works carried out by Van Wassenhove (2006) who argued that enhanced responsiveness in HL through cost efficiency not only improves the timeliness of relief efforts but also builds trust with affected communities and donor

agencies. This result is also consistent with World Food Programme (WFP 2017), which opined efficient use of funds enables HOs to distribute a higher percentage of their budgets directly to aid. By minimizing logistics cost, such as transportation, warehousing, and procurement, HOs could extend their reach and assist more people in need. Moreover, Mendy et al. (2023) highlighted that cost was a predominant resources factor for both commercial and HL, thus HOs must objectively demonstrate beneficial outcome through sustainable and cost-effective operations because responding promptly to a crisis was no longer sufficient. Therefore, HOs must endeavor to implement cost efficient strategies that would allow them to allocate more resources to the affected communities by reducing operational expenses, increasing flexibility, and enhancing responsiveness. To achieve this, HOs could adapt quantity flexible contract, local procurement, and standardization of relief items, embrace limited transportation resources and capacities and utilize warehouse and logistics automation (Mendy et al., 2023). As the demand for humanitarian aid continues to grow, cost efficiency will remain a critical focus for HOs striving to make the most impactful use of limited resources.

In terms of long-term development, it has been maintained that more community participation and the decentralization of conventional top-down approaches are the only ways to achieve greater progress for beneficiaries (Bealt & Afshin Mansouri, 1767). The findings of our research contradict (Bealt & Afshin Mansouri, 1767) augment. Our research findings indicates that community participation and trust have no effect on the performance of HL. This finding is not in line with the work of (Tatham & Kovács, 2010) who concluded that trust was essential in supply chain and it has a positive impact on performance. Moreover, our findings also contradict the work of (Sheppard et al., 2013) who argued that local population involvement would improve logistics preparedness and response to natural disaster thus leading to greater efficiency and effectiveness. Most recent research from (Nassar et al., 2025) also validates the work of Sheppard et al. (2013), when local knowledge and involvement are taken into account, logistics support may help to create resilience; if community members are prepared to handle emergencies, they may learn to become more independent and less reliant on others they concluded. Additionally, involving local populations empowers communities and fosters a sense of ownership, which could lead

to better cooperation and consequently, more successful logistics operations (Heaslip et al., 2018). To achieve this, HOs must leverage on local knowledge, facilitate efficient access, and foster cooperation. These elements contribute to faster, more effective, and more sustainable logistics operations.

Lastly, security of relief items during transport and distribution has been illustrated to positively affect performance in HL. Carmichael and Karamouzian, (2014) stated that attacks on medical personnel providing relief to the affected population in conflict areas have become more frequent. Furthermore, according to Wood and Sullivan (2015), humanitarian aid creates an incentive, especially for armed groups that lack the financial resources and access to resources that states have, and as a result, they view humanitarian aid workers as a convenient means of obtaining these resources because they seemingly lack protection. Therefore, security concerns, particularly in countries marked by conflict and instability are a central factor influencing the efficiency of relief aid operation (Kudu & Karia 2024). Nigeria being rank the 7th most terrorized country in the world, which makes her the most terrorism-stricken country in Africa alongside Somalia (Okoli et al., 2014), the activities of terrorist groups like Boko Haram, have posed significant challenges especially in the Northwest region, demanding complex security measures that strain the resources and capabilities of HOs (Lanre & Shaibu, 2020). For example, CBS News in Oct 2018 reported abduction and subsequent execution of two humanitarian aid workers employed by the International Committee of the Red Cross (ICRC) to provide basic medical care to internally displaced Nigerians fleeing the ongoing armed violence in north eastern Nigeria in Rann. Similarly, in July 2020, (CGTN Africa, n.d.) TVC News Nigeria also reported that five aid workers were kill by Boko Haram in Brono State. Consistent to our result, Heaslip et al., (2018) highlighted that losses during transit could disrupt aid operations, as scare resources become even more limited, ultimately delaying or limiting the amount of aid that reaches those in need. Thomas and Kopczak (2005) shared the view that secure transport routes and strong partnerships with local communities, government agencies, and security providers could help mitigate risks, creating a more resilient and predictable logistics operation. Our finding is also in line with (Khan et al., 2019; Kunz & Reiner, 2012) who argued that the security situation of a country strongly affects the performance of HL. The evidence gathered by this research shows

that security on humanitarian operation is critical in relief aid success. While it should come as no surprise that security of relief items during transport and distribution makes it as a CSFs, because accessing affected communities and meeting their needs become much easier. The result is also in line with Behl et al. (2019), where security of relief items during transport and distribution was found to be a causal factor. Security measure does not only protect aid but also protect humanitarian personnel, who are crucial to logistics operations. By safeguarding both personnel and aid, HOs could reduce the risk of personnel withdrawals or operation halts, which are costly and could severely compromise the delivery of critical aid (Heaslip et al., 2018). This finding implies that HOs need to make sure that security of relief items during transport and distribution is prioritized because it has a profound impact on humanitarian logistics performance. By preventing losses, enhancing predictability, building community trust, and protecting personnel, security measures enable more reliable, effective, and sustainable aid operations.

5.2 Conclusions

Previous research provided useful findings and recommendations for future research. Some researcher suggested case studies and survey approaches be used to validate findings of their research with regards to CSFs. Others have published relationships between CSFs and performance in HL, but it is rare to see the categorization of the CSFs into the three-management level of strategic, tactical, and operational where fair decisions could be made. Furthermore, none of them used empirical studies to validate CSFs at the operational level. Accordingly, this study attempts to respond to the growing call of operational researcher to use empirical studies to explore the CSFs in HSCM (Damoah, 2022) and to conduct research in developing countries (De Farias et al., 2021). Hence, data was collected from field workers at the operational level from Nigeria who are involve in relief aid operations. In addition, so far, this research was the first to investigate CSFs in HSCM in Nigeria and hence is original in the context of CSFs.

To ensure that HOs continued to provide aid during disasters, our research attempt to identify OCSFs that affect the performance in terms of speed in responding

to the plights of affected population. Based on literature review and experts' inputs, a total of 19 CSFs has been selected and classified in to the three management levels of strategic, tactical and operational as shown in figure 2.1. Because the focus of our research was on the operational level, out of the 19 CSFs, 8 CSFs have been categorized as crucial factors at the operational level as shown in figure 2.2. Using stepwise regression analysis, these OCSF were analyzed and based on our analysis as shown in table 4.15, it could be concluded that security of relief items during transport and distribution ($\beta = .305$, $p < 0.05$), cost efficiency ($\beta = .203$, $p<0.05$) and quality and availability of relief items ($\beta = .149$, $p<0.05$) have a positive impact on the performance of HL, while other factors that were engagement of suppliers at an early stage, assessment accuracy, degree of information sharing, speed of delivery, and community participation and trust were not supported by our analysis.

The study has justified that regression analysis is a reliable analytic application in humanitarian operations (Nyile, 2023; Erastus Kiswili et al., 2021b; Ataseven et al., 2018) because the research objective has been achieved. Therefore, this research contributes to the academic literature of regression analysis.

Our finding adds to the literature that discuss crucial factor that contribute to HL operations' success. We contributed to HL literature by revealing CSF in the three levels of strategic, tactical, and operational. In addition, the study validates OCSF that is vital to enhance aid operations. The result of our research shows that cost, quality and availability of relief items, and security are predominant resource factors in HL. The result suggests that the more secure an aid operation is the more cost efficient and transparent the operation is likely to be. Therefore, in insecure or conflict-prone regions, where relief operations are often conducted, maintaining the security of supplies not only ensures the intended aid reaches affected populations but also preserve resources, build trust, and safeguards the personnel involved in distribution efforts.

Academic and policymakers globally could use our findings to guide during decision-making regarding CSFs in HL. Specifically, the Government in Nigeria and other governments around could formulate by-laws to improve the HSC network. Our research also contributes to studies carried out on the African continent considering the fact that there is a need for further studies in developing countries. In many developing countries like Nigeria, the majority of people reside in disaster-prone areas and other

vulnerable conditions exposing them to high risks of natural and human disasters (De Farias et al., 2021; Olanrewaju et al., 2019; Mashi et al., 2019). Hence, HOs are seeking ways to improve HL performance especially in these areas.

Our research suggests that an in-depth understanding of the factors that are critical is one way of achieving that. Among the nine obligations established by the Core Humanitarian Standard on quality and accountability are the provision of humanitarian aid at the appropriate time and with the right assistance (The Core Humanitarian Standard, 2014). They could be accomplished by providing the beneficiaries with regular need assessments, information sharing, and an opportunity to participate in the design of the intervention. This will encourage them to actively participate at different phases of the process, which should ultimately lead to an improvement in HL performance.

This study like many has limitations. First, though this study is empirical and could guide policymakers in the decision-making, care must be taken in generalization of result since data was collected from one country and within a specific managerial level. This might pose threat to the validity and generalizability of the result. Thus, the researchers recommend conducting similar studies in other levels (strategic and tactical) and in other countries to have generalized conclusions. Furthermore, the research method could incorporate various techniques such as exploratory factor analysis, confirmatory factor analysis and structural equation modelling etc. which could offer further insights.

REFERENCE

Abazari , Reza, S., Aghsami, A., & Rabbani, M. (2021). Prepositioning and distribution reliefs items in humanitarian logistics with uncertain parameters. *Socio-Economic Planning Sciences, 74*.

Abbas, Monday, A., Abbas, I. I., & Agada, G. I. (2018). Natural Hazards and their Impacts on the Environment and Agriculture in Nigeria. *International Journal of Advanced Research and Publications, 2*, 85-91.

Abidi , H., Leeuw, S. D., & Dullaet, W. (2020). Performance management practices in humanitarian organisations. *Journal of Humanitarian Logistics and Supply Chain Management, 10*, 125-168.

Abidi, H., Leeuw, S. D., & Klumpp, M. (2013). Measuring success in humanitarian supply chains. *International Journal of Business and Management Invention, 2*, 31-39.

Abidi, H., Leeuw, S. D., & Klumpp, M. (2014). Humanitarian supply chain performance management: a systematic literature review. *Supply Chain Management: An Internatioanl Journal*, 592-608.

Aboagye , D. D., Dari, T., & Koomson, J. (2013). Risk perception and disaster management in the savannah region of Ghana. International Journal of Humanities and Social Science

Agarwal, S., Kant , R., & Shankar, R. (2022). Exploring sustainability balanced scorecard for performance evaluation of humanitarian organizations. *Cleaner Logistics and Supply Chain, 3*.

Aghajani , Mojtaba, & Torabi, A. S. (2020). A mixed procurement model for humanitarian relief chains. *Journal of Humanitarian Logistics and Supply Chain Management, 10*, 45-74.

Agostinho, C. F. (2013). Humanitarian logistics: How to help even more? *IFAC Proceedings, 46*, 206-210.

Ahimbisibwe, A., Ssebulime, R., Tumuhairwe, R., & Tusiime, W. (2016). Supply chain visibility, supply chain velocity, supply chain alignment and humanitarian supply chain relief agility. *European Journal of Logistics, Purchasing and Supply Chain Management, 4*, 34-64.

Akhtar , P., Marr, E., & Garnevska, V. (2012). Coordination in humanitarian relief chains: chain coordinators. *Journal of humaitarian logistics and supply chain management*, 85-103.

Akinbinu, V. A. (2010). Prediction of Fracture gradient from formation pressures and depth using correlation and stepwise multiple regression techniques. *Journal of Petroleum Science and Engineering*, 10-17.

Anand , N., & Neha, G. (2015). Measuring retail supply chain performance: Theoretical model using key performanve indicators (KPIs). *Benchmarking: An International Journal, 22*, 135-166.

Anderson, J. C., Anderson , J., & James , N. A. (1990). A model of distributor firm and manufacturer firm working partnerships. *Journal of marketing, 54*, 42-58.

Anjomshoae , A., Banomyong, R., Mohammed, F., & Kunz, N. (2022). A systematic review of humanitarian supply chains performance measurement literature from 2007 to 2021 . *International Journal of Disaster Risk Reduction*, 72, 102852

Anjomshoae , A., Hassan, A., & Wong , K. (2019). An integrated AHP-based scheme for performance measurement in humanitarian supply chains . *International Journal of Productivity and Performance Management*, 938-957.

Anjomshoae , A., Hassan, A., Wong, K., & Banomyong , R. (2021). An integrated nulti-stage fuzzy inference performance measurement scheme in humanitaian relief operations . *International Journal of Disaster Risk Reduction* .

Anjomshoae, A., Hassan, A., Kunz, N., Wong, K., & De Leeuw, S. (2017). Towards a dynamic balanced scorecard model for humanitarian relief organizations . *Journal of Humanitarian Logistics and Supply Chain Management*, 194-218.

Arababadi , R., Salim , M., Asmar, M. E., Haavaldsen, T., & Parrish, K. (2017). *Energy policy assessment at strategic, tactical, and operational levels: Case Studies of EU 2020 and US Executive Order* . Energy Policy .

Asuero, G. A., Ana Sayago, & Gonzalez, A. (2006). *The correlation coefficient: An owerview* . Critical review in analytical chemistry.

Ataseven, C., Nair, A., & Ferguson, M. (2018). An examination of the relationship between intellectual capital and supply chain integration in humanitarian aid organizations: a survey-based investigation of food banks. *Decision Sciences 49*(5), 827-862.

Atmowardoyo , H. (n.d.). Research methods in TEFL studies: Descriptive research, case study, error analysis, and R & D. *Journal of Language Teacher and Research* , 197-204.

Azmat , M., Atif , M., & Kummer, S. (2019). Identification and prioritization of critical success factors in faith-based and non-faith-based organizations' humanitarian supply chain . *Journal of International Humanitarian Action, 4*, 1-17.

Baharmand , H., Comes , T., & Lauras , M. (2019). Defining and measuring the network flexibility of humanitarian supply chains: insighs from the 2015 Nepal earthquake. *Annals of Operations Research, 283*, 961-1000.

Balcik, B., Beamon, B. M., Krejci, C. C., Muramatsu, K. M., & Ramirez, M. (2010). Coordination in humanitarian relief chains: Practices, challenges and opportunities . *International Journal of Production economics, 126*(1) 22-34.

Baral, R. L. (2021). *Impact of Supply Chain Management and Contingency Planning on Humanitarian Response: Practices of International Humanitarian Organizations in Nepa*l. Master's thesis, Indira Gandhi National Open University .

Bardhan, K. A., & Dangi, K. H. (2016). Drivers and Indicators of performance in relief chain: an empirical study . *Global Business Review, 17*, 88-104.

Bealt, J., & Mansouri, A. S. (2018). From disaster to development: a systematic review of community-driven humanitarian logistics. *Disaster,* 42(1) p, 124-148.

Beamon , B. M., & Balcik, B. (2008). Performance measurement in humanitarian relief chains . *International Journal of public sector management, 21*, 4-25.

Behl , A., Dutta , P., & Gupta, S. (2019). Critical success factors for humanitarian supply chain management: a grey DEMATEL approach . *IFAC-PapersOnLine,* 52(13) , 159-164.

Blanca, M. J., Arnau, J., Lopez-Motiel, D., Bono, R., & Bendayan, R. (2013). *Skewness and Kurtosis in real data samples*. Methodology, 9, 78-84 .

Boon, O. (2013). *Total quality management and knowledge management in Malaysian manufacturing and service firm: a structural equation modelling approach.* University of Malaya.

Brown , C. E. (1993). Use of principal-component, correlation, and stepwise multiple-regression analyses to investigate selected physical and hydraulic properties of carbonate-rock aquifiers . *Journal of Hydrology, 147*, 169-195.

Brown , D., & Warschauer, M. (2006). From the university to elementary classroom: Student's experiences in learning to integrate technology in instruction. *Journal of Technology and Teacher Education 14*(3), 599-621.

Cardoso, B. d., & Da silva, J. F. (2021). Application of structural equation modeling in humanitarian operations. *Revista Producao Online 21*(4).

Carmichael , J.-L., & Karamouzian, M. (2014). Deadly professions: violent attacks against aid-workers and the health implications for local populations. *International journal of health policy and management* , *65*.

Cavinato , J. L. (1992). Evolving procurement organizations: logistics implications. *Journal of business logistics 13*(1), 27.

CBS NEWS. (2025, January 30). boko haram faction kill two aid workers https://www.cbsnews.com/video/boko-haram-factions-kill-two-aid-workers/

Celik , E., & Gumus, A. T. (2016). An outranking approach based on interval type-2 fuzzy sets to evaluate preparedness and response ability of non-government humanitarian relief organizations . *Computers & Industrial Engineering, 101*, 21-34.

Celik, E., & Gumus , A. (2018). An assessment approach for non-government orgaizations in humanitarian relief logistics and application in Turkey. *Technological and Economic Development of Economy 24(1)*.

CGTN Africa. (n.d.). Boko haram kills 5 aid workers. Retrieved January 30, 2024, from https://africa.cgtn.com/boko-haram-kills-5-aid-workers-in-nigeria/

Chandes, J., & Pache, G. (2010). Strategizing humanitarian logistics: The Challenges of collective action. . *Problems and Perspectives in Management, 8*, 99-107.

Cho, H.-C., & Abe, S. (2013). Is two-tailed testing for directional research hypotheses test legitimate . *Journal of Business Research 66*(9), 1261-1266.

Cook, R. A., & Lodree, E. J. (2017). Dispatching policies for last-mile distribution with stochastics supply and demand . *Transportation Research Part E: Logistics and Transportation Revie, 106*, 353-371.

Damoah, I. S. (2022). Exploring critical success factorss (CSFs) of humanitarian supply chain management (HSCM) in flood disaster management (FDM) . *Journal of humanitarian logistics and supply chain management 12*(1), 129-153.

Dancey, C. P., & John, R. (2007). *Statistics without maths for psychology* . Pearson education.

Dash, G., & Paul, J. (2021). CB-SEM vs PLS-SEM methods for research in social sciences and technology forecasting. *Technological Forecasting and Social Change, 173*.

Davidson , A. (2006). Key performance indicators in humanitarian logistics . *Doctoral dissertation,* Massachustts Institute of Technology.

De Maesschalck, R., Jouan-Rimbaud , D., & Massart, D. L. (2000). The mahalanobis disatance . *Chemometrics and intelligent laboratory systems 50*(1) , 1-18.

Ding, X.-F., & Liu, H.-C. (2018). A 2-dimension uncertain linguistic DEMATEL method for identifying critical success factors in emergency management . *Applied Soft Computing, 71*, 386-395.

Dubey, R., Singh, T., & Gupta, O. K. (2015). Impact of agility, adaptability and aligment on humanitarian logistics performance: mediating effect of leadership . *Global Business Review*, 812-831.

Duran, S., Ergun, O., Keskinocak , P., & Swann, J. L. (2012). Humanitarian logistics: advance purchasing and pre-positioning of relief items. *In Handbook of global logistics: Transportation in international supply chains*, 447-462.

EM-DAT (Emergency Event-Database). (2023, 02 18). http://www.emdat.be/2 2023.

Ertem, M. A., & Buyurgan, N. (2013). A procurement auctions-based framework for coordinating platforms in humanitarian logistics. *Humanitarian and Relief Logistics*, 111-127.

Fahimnia , B., Jabbarzadeh, A., Ghavamifar, A., & Bell, M. (2017). Supply chain design for efficient and effective blood supply in disasters. *International journal of Production economics*, 700-709.

Fernandes , N. C., Taglialenha, S. d., & Silva, V. D. (2016). Performance measures to humanitarian logistics: the perspective of the humanitarian assistance chain. *In Transdisciplinary Engineering: Crossing Boundaries*, 1113-1120.

Fitner, K. (2007). Reliability and validity a quick review. *The Diabetes Educator*, 775-780.

Fornell, C., & Larcker , D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of marketing research 18(1)*, 39-50.

Freund, Y. P. (19881). Critical Success factors. *Planning Review, 16*(4), 20-23.

Ghavamifar, A. S., Torabi, A., & Moshtari, M. (2022). A hybrid relief procurement contract for humanitarian logitics. *Transportation Research Part E: Logitics and Transportation Review, 167*.

Golafshani , N. (2003). Understanding reliability and validity in qualitative research . *The qualitative report 8*(4), 597-607.

Goldschmidt, K. H., & Kumar , S. (2016). Humanitarian operations and crisis/disaster management: A retrospective review of the literature and framework for development. *International Journal of Disaster Risk Reduction, 20*, 1-13.

Gunasekaran , A., & Ngai , E. W. (2004). Virtual supply-chain management . *Production Planning & Control, 15*(6), 584-595.

Gunasekaran , A., & Ngai, E. W. (2003). The successful management of a small logistics company. *International Journal of Physical Distribution & Logistics Management 33*(9), 825-842.

Gunasekaran , A., Patel, C., & McGaughey, R. E. (2004). A framework for supply chain performance measurement 87(3). *International journal of production economics*, 333-347.

Gunasekaran, A., Patel , C., & Tirtiroglu, E. (2001). Performance measures and metrics in a supply chain environment . *International journal of operations & production management*, 71-97.

Haghani, A., & Oh, S.-C. (1996). Formulation and solution of a multi-commodity, multi-modal network flow model for disaster relief operations. *Transportation Research Part A: Policy and Practice 30(3)*, 231-250.

Hair , J., Black , W., Babin, B., Anderson , R., & Tatham, R. (2010). *Multivariate Data Analysis*: Pearson Prentice Hall.

Han , Y., & Deng, Y. (2018). An enhanced fuzzy evidential DEMATEL method with its application to identify critical success factors. *Soft computing, 22*, 5073-5090.

Heaslip , G., Kovacs, G., & Haavisto, I. (2018). Innovations in humanitarian supply chains: the case of cash transfer programmes. *Production Planning & Control, 29,* (14), 1175-1190.

Henderson, D. A., & Denison, D. R. (1989). Stepwise regression in social and psychological research . *Psychological Reports 64*(1), p, 251-257.

Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling . *Journal of the academy of marketing science, 43*, 115-135.

Hong, J., Suh, E., & Hou, L. (2008). Identifying the factors influencing the performanve of reverse supply chains (RSC). *International journal of sustainable engineering 1*(3), 173-187.

Ika, L. A., Diallo, A., & Thuillier, D. (2012). Critical success factors for World Bank projects: An empirical investigation. *International Journal of project management 30*(1) , 105-116.

Ikart, E. M. (2019). Survey questionnaire survey pretesting method: An evaluation of survey questionnaire via expert reviews technique. *Asian Journal of Social Science Studies, 4*(2).

Jahre, M., & Jensen, L.-M. (2010). Coordination in humanitarian logistics through clusters. *International Journal of Physical Distribution & Logistics Management 40*(8/9*)*, 657-674.

John, L., & Gurumurthy, A. (2022). Are quantity flexibility contracts with discounts in the presence of spot market procurement relevant for the humanitarian supply chain? An exploration. *Annals of Operations Research, 315*(2), 1775-1802.

John, L., Gurumurthy, A., Mateen, A., & Narayanamurthy, G. (2022). Improving the coordination in the humanitarian supply chain: exploring the role of options contract. *Annals of Operations Research, 319* (1), 15-40.

John, L., Gurumurthy, A., Soni, G., & Jain, V. (2019). Modelling the inter-relationship between factors affecting coordination in a humanitarian supply: a case of Chennai flood relief . *Annals of Operations Research, 283*, 1227-1258.

John, L., Ramesh, A., & Sridharan, R. (2012). Humanitarian supply chain management: a critical review . *International Journal of Services and Operations Management 13(4)*, 498-524.

Kabra, G., & Ramesh, A. (2015). Segmenting critical success factors for enhancing the use of IT in humanitarian supply chain management. *Procedia-Social and behavioral sciences 189*, 144-152.

Kabra, G., Ramesh, A., & Arshinder, K. (2015). Identification and pripritization of coordination barriers in humanitarian supply chain management. *International Journal of Disaster Risk Reduction* , 128-138.

Kaplan , R. S., & Norton, D. P. (2005). *The balanced scorecard: measures that drive performance.* Harvard Business Review.

Khalifa, A. (2021). Strategy and what it means to be strategic: redefining strategic, operational, and tactical decisions . *Journal of strategy and management*, 381-396.

Khan, M., Yong, L., & Han, B. (2019). Emerging techniques for enhancing the performance of humanitarian logistics . *International journal of supply chain management*, 450.

Kiswili , N. E., Shale, I. N., & Osoro, A. (2021). Influence of supply chain leagility on performance of humanitarian aid organizations in Kenya. *Journal of Business and Economic Development*, 37.

Kiszely, J. (2005). Thinking about the operational level. *The RUSI journal*, 38-43.

Kofar Kudu, U., & Karia, N. (2024). The effects of the factors affecting sustainability of Nigeria humanitarian logistics firms: The mediation effect of the leadership. *Global Business & Management Research, 16*.

Kord, H., & Parvaneh , S. (2023). *Coordination of humanitarian logistics based on the quantity flexibility contract and buying in the spot market under demand uncertainty using NSGA-ll and NRGA algorithms.* Expert Systems with Applications .

Kovacs, G., & Spens, K. (2009). Identifying challenges in humanitarian logistics. *International Journal of Physical Distribution & Logistics Management* , 506-528.

Kovacs, G., & Spens, K. M. (2007). Humanitarian logistics in disaster relief operations. *International journal of physical distribution & logistics management*, 99-114.

Kunz, N., & Reiner, G. (2012). A meta-analysis of humanitarian logistics research. *Journal of Humanitarian Logistics and Supply Chain Management 2*, 116-147.

Kuruppuge, H. R., & Gregar, A. (2020). *Strategic, tactical and operational decisions in family businesses: A qualitative case study*. Qualitative Report.

Lager, T., & Horte, S.-A. (2005). Success factors for the development of process technology in process industry. Part 1: a classification system for success factors and a rating of success factors on a tactical level . *Internatioanl journal of Process Management and Benchmarking 1,* 82-103.

Lamenza, A. d., Fontainha, T. C., & Leiras , A. (2019). Purchasing strategies for relief items in humanitarian operations. *Journal of Humanitarian Logisticsand Supply Chain Management*, 151-171.

Lan, Y., & Guo, S. (2008). Multiple stepwise regression analysis on knowledge evaluation. *In International Conference on Management of e-Commerce and e-Government* (pp. 297-302). IEEE.

Larrea, O. (2013). Key performance indicators in humanitarian logistics in Colombia. *IFAC Proceedings Volumes*, 46(24), p. 211-216. IFAC

Larson, P. D., & Foropon, C. (2018). Process improvement in humanitarian: an organisational theory perspective. *International Journal of Production Research*, 6828-6841.

Leidecker, J. K., & Bruno, A. V. (1984). Identifying and using critical success factors. *Long range planning*, 23-32.

Lekwot , V. E., Yakubu, A. A., Okafor, C., & Balasom, M. K. (2014). Climate change and its effect on natioanl security in Nigeria. *International Journal of Interdisciplinary Research and Innovations, 2*, 6-10.

Li, C.-j., Chai, Y.-q., Yang, L.-s., & Li, H.-r. (2016). Spatio-temporal distribution of flood disasters and analysis of influencing factors in Africa. *Natural Hazards*, 721-731.

Li, Y., Hu, Y., Zhang, X., Deng, Y., & Mahadevan, S. (2014). An evidential DEMATEL method to identify critical success factors in emergency management . *Applied Soft Computing, 22*, 504-510.

Liu, K., Zhang, H., & Zhang, Z.-H. (2021). The efficiency, equity and effectiveness of location strategies in humanitarian logistics: A robust chance-constrained approach. *Transpotation Research Part E: Logistics and Transportation Review, 156*.

Liu, Y., Tian, J., Feng, G., & Hu, Z. (2019). A relief supplies purchasing model via option contracts. *Computers & Industrial Engineering, 137*.

Long, D. (1997). Logistics for disaster relief: Engineering on the run. *IIE solutions 29*(6), 26-30.

Loree, N., & Aros-Vera, F. (2018). Points of distribution location and inventory management model for Post-Disaster Humanitarian Logistics . *Transportation Research Part E: Logistics and Transportation Review, 116*, 1-24.

Louw, E., Olanrewaju, C. O., Olanrewaju, O. A., & Chitakira, M. (2019). Impacts of flood disaster in Nigeria: A critical evaluation of health implications and management. *Journal of Disaster Risk Studies 11(*1), 1-9.

Lu, Q., Goh, M., & Souza, R. D. (2016). A SCOR framework to measure logistics performance of humanitarian organizations . *Journal of Humanitarian Logistics and Supply Chain Management, 6*(2), 222-239.

Luo, D., Pettit , S. J., & Beresford, A. K. (2006). Critical success factors for emergency relief logistics . *WHAMPOA-An Interdisciplinary Journal 51*, 177-184.

Maghsoudi, A., & Pazirandeh, A. (2016). Visibility, resource sharing and performance in supply chain relationships: insights from humanitarian practitioners. *Supply Chain Management: An International Journal, 21*(1), 125-139.

Mahmoud, A. B., Alatrash, M., Fuxman, L., Hack-Polay, D., & Grigoriou, N. (2019). Validating a new total quality management-benchmarking measurement model in an international humanitarian setting. *Nonprofit Management and Leadership 30*(1) , 167-182.

Makepeace , D., Tatham, P., & Wu, Y. (2017). Internal integration in humantarian supply chain management: perspectives at the logistics-programmes interface. *Journal of Humanitarian Logistics and Supply Chain Management, 7*(1), 26-56.

Maon, F., Lindgreen, A., & Vanhamme, J. (2009). Developing supply chains in disaster relief operations through cross-sector socially oriented collaborations: a theoretical model. *Supply chain management: an International Journal 14*(2), 149-164.

Marczyk, G. R., Heibrun, K., Lander, T., & DeMatteo, D. (2005). Developing a model for classification and prediction. *Criminal Justice amd Behavior 32*(3), 278-301.

Mardia, K. V. (1970). Measures of multivariate skewness and kurtosis with applications. *Biometrika 57*(3), 519-530.

Marill, K. A. (2004). Advanced statistics: linear regression, part ll: multiple linear regression . *Academic emergency medicine 11,* (1), p, 94-102.

Martinez, A. J., Stapleton , O., & Van Wassenhove, L. N. (2011). Field vehicle fleet management in humanitarian operations: A case-based approach. *Journal of operations management, 29*(5), 404-421.

Mashi, S. A., Oghenejabor, O., & Inkani, A. (2019). Disaster risks and management policies and practices in Nigeria: A critical appraisal of the Natioanl Emergency Management Agency Act. *International Journal of disaster risk reduction, 33*, 253-265.

Master, J. (2024). *YALE Climate Connections Newsletter.* https://yaleclimateconnections.org/2023/05/five-of-africas-top-30-deadliest-weather-disasters-have-occurred-since-2022/

McHugh, M. (2011). Multiple comparison analysis testing in ANOVA. *Biochemia medica*, 203-209.

Mendy, T., Kongbuamai, N., & Yamsa-ard, S. (2023). Critical success factors for humanitarian logistics: A literature review. *In International Conference on Decision Aid Sciences and Applications (DASA)* (pp. 34-42). IEEE.

Miller, R. L., Acton, C., Fullerton, D. A., Maltby, J., & Campling, J. (2002). Analysis of variance (ANOVA) . *SPSS for Social Scientists*, 145-154.

Mishra, B., Dahal, K., & Pervez, Z. (2022). Dynamic relief items distribution model with sliding time window in the post-disaster environment . *Applied Sciences 12(16)* .

Modgil, S., Singh, R. K., & Foropon, C. (2022). Quality management in humanitarian operations and disaster relief management: A review and future research directions. *Annals of operations research*, 1-54.

Mohammed Zain, R., Mohd Zahari, H., & Mohd Zainol, N. (2023). Inter-agency information sharing coordination on humanitarian logistics support for urban disaster management in Kuala Lumpur. *Frontiers in Sustainable Cities 5*.

Najjar, M. S., Dahabiyeh, L., & Nawayseh, M. (2019). Share if you care: the impact of imformation sharing and information quality on humanitarian supply chain performance -a social capital perspective . *Information Development 35*(3), 467-481.

Nau, R. (2016). *Statistical forecasting: notes on regression and time series analysis. Stepwise and All Possible Regressions.* Available online:https://people. duke. edu/ rnau/regstep.htm.

Neely, A., Gregory, M., & Platts, K. (1995). Performance measurement system design: A literature review and research agenda. *International journal of operations & production management*, 80-116.

Negi, S., & Negi, G. (2021). Framework to management humanitarian logistics in disaster relief supply chain management in India. *International Journal of Emergency Services 10*(1) , 40-76.

Neuman, W. L., & Lincoln, A. E. (2006). *Workbook for Neumann Social research methods: qualitative and quantitative approaches .* Allyn & Bacon.

Nikkhoo, F., Bozorgi-Amiri, A., & Heydari, J. (2018). Coordination of relief items procurement in humanitarian logistic based on quality flexibility contract. *International Journal of Disaster Risk Reduction, 31*, 331-340.

Nyile, E. K. (2023). *Supply chain Leagility, Organizational Characteristics and Performance of Humanitarian Aid Organizations in Kenya*. Doctoral dissertation, JKUAT-COHRED.

Nyile, E. K., Shale, I. N., & Osoro, A. (2022). Supply Chain Responsiveness and Performance of Humanitarian Aid Organizations in Kenya. *International Journal of Social Sciences Management and Enterpreneurship (IJSSME) 6(2)*.

Oakland , J. S. (2014). *Total quality management and operational excellence.* Routledge.

Obeta, M. (2014). Institutional approach to flood disaster management in Nigeria: need for preparedness plan. *British Journal of Applied Science & Technology*, 4575-4590.

Okoli , A., & Lortyer, P. (2014). Terrorism and humanitarian crisis in Nigeria: Insights from Boko Haram insurgency. *Global Journal of Human Social Science 14*(1), 39-49.

Oloruntoba, R. (2010). An analysis of the Cyclone Larry emergency relief chain: Some key success factors. . *International Journal of Production Economics 126*(1), 85-101.

Olu-Adeyemi , L. (2020). Is there borderline in Nigerias northeast? Multi-natioanl joint task force and counterinsurgency operation in perspective . *African Journal of Political Science and International Relations 14*(2), 33-45.

Patil, A., Madaan, J., Chan, F. T., & Charan, P. (2022). Advancement of performance measurement system in the humanitarian supply chain. *Expert Systems with Applications, 206*.

Pedraza-Martinez, A. J., & Van Wassenhove, L. N. (2012). Transportation and vehicle fleet management in humanitarian logistics: challenges for future research . *EURO Journal on Transportation and Logistics, 1*, 185-196.

Pettit, S., & Beresford, A. (2009). Critical success factors in the context of humanitarian aid supply chains . *International Journal of physical distribution & logistics management 39(6)*, 450-468.

Power, D. J., Sohal, A. S., & Rahman, S.-U. (2001). Critical success factors in agile supply chain management-An empirical study . *International Journal of Physical distribution & logistics management 31(4)*, 247-265.

Puschmann, T., & Alt, R. (2005). Successful use of e-procurement in supply chains. *Supply Chain Management: an International Journal 10(2)* , 122-133.

Rahim, A. M., & Magner, N. R. (1995). Confirmatory factor analysis of the styles of handling interpersonal conflict: first-order factor model and its invariance across groups. *Journal of applied psychology 80(1)*.

Ram, J., & Corkindale, D. (2014). How critical are the critical success factors (CSFs)? Examining the role of CSFs for ERP. *Business process management journal 20(1)*, 151-174.

Rao Tummala, V., Philip, C. L., & Johnson, M. (2006). Assessing supply chain management success. *Supply Chain Management: An International Journal 11(2)*, 179-192.

Reddy, L. S., & Kulshrestha, P. (2019). Performing the KMO and Bartlett's test for factors estimating the warehouse efficiency, inventory and customer contentment for e-retail supply chain. *International Journal for Research in Engineering Application & Management 5(9)* , 1-13.

Regmi, P. R., Waithaka, E., Paudyal, A., Simkhada, P., & Van Teijlingen, E. (2016). Guide to the design and application of online questionnaire surveys . *Nepal journal of epidemiology 6(4)*, 640.

Richard , T. (1990). Interpretation of the correlation coefficient: a basic review. *Journal of diagnostics medical sonography 6(1)*, 35-39.

Rodon, J., Serrano, J. M., & Gimenez, C. (2012). Managing cultural conflicts for effective humanitarian aid. *International Journal of Production Economics 139(2)*, 366-376.

Roh, S., Lin, H. H., & Jang, H. (2022). Performance indicators for humanitarian relief logistics in Taiwan. *The Asian Journal of Shipping and Logistics 38(3)*, 173-180.

Rongier, C., Gourc, D., Lauras, M., & Galasso, F. (2010). Towards a performance measurement system to control disaster response. In collaborative Network for a Sustainable World . *In 11th IFIP WG 5.5 Working Conference on Vitual Enterprises* (pp. 189-196). Springer.

Safeer, M., Anbuudayasankar, S. P., Balkumar, K., & Ganesh, K. (2014). Analysing transportation and distribution in emergency humanitarian logistics. *Procedia Engineering, 97*, 2248-2258.

Santarelli , G., Abidi , H., Klumpp, M., & Regattieri, A. (2015). Humanitarian supply chain and performance measurement schemes in practice. *International journal of productivity and performance management, 64*(6), 784-810.

Sawitri, D. R., Creed, P. A., & Zimmer-Gembeck, M. J. (2013). The adolescent-parent career congruence scale:Development and initial validation. *Journal of career Assessment 21* (2), 210-226.

Sawyer, S. (2009). Analysis of variance: the fundamental concept. *Journal of Manual & Manipulative Therapy, 17*(2), 27E-38E.

Schiffling , s., & Piecyk, M. (2014). Performance measurement in humanitarian logistics: aa customer-oriented approach. *Journal of Humanitarian Logistics and Supply Chain Management 4*(2), 198-221.

Schulz, S. F., & Heigh, l. (2009). Logistics performance management in action within a humanitarian organization. *Management Research News 32,(11)*, 1038-1049.

Shafiq, M., & Soratana, K. (2019). Humanitarian logistics and supply chain management- a qualitative study. *LogForum 15(1)*.

Shafiq, M., & Soratana, K. (2020). Lean readiness assessment model- a tool for humanitarian organizations'social and economic sustainability. *Journal of Humanitarian Logistics and Supply Chain Management*, 77-99.

Shafiq, M., Akhtar, A., Tahir, A., Akhtar, N., & Kashif, A. R. (2021). Efficiency and effectiveness of humanitarian organizations'logistics and supply chain management: a systematic review. *PalArch's Journal of Archaeology of Egypt, 18*(7), 811-855.

Shakeri , E., Vizvari, B., & Nazerian, R. (2021). Comparative analysis of disaster management between india and Nigeria. *International Journal of Disaster Risk Reduction, 63*.

Sharmin, A., Rahman, M. A., Ahmed, S., & Ali, S. M. (2024). Addressing critical success factors for improving concurrent emergency management: lessons learned from the COVID-19 pandemic. *Annals of Operations Research*, 1-35.

Sheppard , A., Tatham, P., Fisher, R., & Gapp, R. (2013). Humanitarian logistics: enhancing the engagement of local populations . *Journal of Humanitarian Logistics and supply chain Management 3*(1), 22-36.

Sila, I., Ebrahimpour, M., & Birkholz, C. (2006). Quality in supply chains: an empirical analysis. *Supply chain Management: An International Journal 11(6*), 491-502.

Silhavy, R., Silhavy, P., & Prokopova, Z. (2017). Analysis and selection of a regression model for the use case points method using a stepwise approach . *Journal of Systems and Software 125*, 1-14.

Sisay, A., & Liku, M. (2022). Supply chain Management Practice and its Impact on Performance of Humanitarian Relief Organization in Case of Gedeo Zone. *International Journal of Financial Accounting, and Management 4*(3), 269-284.

Somapa, S., Cools, M., & Dullaert, W. (2018). Characterizng supply chain visibility-a literature review. . *The International journal of Logistics Management 29*(1), 308-339.

Standard, C. H. (2014). Core humanitarian standard on quality and accountability . *Geneva: CHS*.

Stevens , J. (2002). *Applied multivariate statistics for the social sciences,* Vol. 4. Lawrence erlbaum associates.

Talib , A., Syazwan, M., & Hamid , A. B. (2014). Application of critical success factors in supply chain management. *International Journal of Supply Chain Management*, 3(1), 21-33

Tatham, P., & Kovacs, G. (2010). The application of swift trust to humanitarian logistics. *International Journal of Production Economics 126*(1) , 35-45.

Thabane, L., Ma, J., Chu, R., Cheng, J., Ismaila, A., Rios, L. P., . . . Goldsmith, C. H. (2010). A tutorial on pilot studies: the what, why and how. *BMC medical research methodology, 10*, 1-10.

Thomas , A. S., & Kopczak, L. R. (2005). From logistics to supply chain management: the path forward in the humanitarian sector. *Fritz Institute 15(1)*, 1-15.

Thomas, A. (2003). *Humanitarian Logistics: Enabling Disaster Response.* Fritz Institute .

Thomas, A., & Mizushima, M. (2005). Logistics training: necessity or luxury. *Forced migration review 22(22)*, 60-61.

Tomasini, R. M., & Van Wassenhove, L. N. (2009). From preparedness to partnerships: case study research on humanitarian logistics . *International Transactions in operational research 16(5)*, 549-559.

Trkman , P. (2010). The critical success factors of business process management. *International journal of information management 30,(2)* , 125-134.

Union, Inter-Parliamentary (2011). *International Federation of Red Cross and Red Crescent Societies*. IFRC

United Nations Office for Disaster Risk Reduction. (2022). *Global assessment report on disaster risk reduction 2022: Our world at risk: Transforming government for a resilient future.* UN.

Uyanik, G. K., & Guler, N. (2013). A study on multiple linear regression analysis. *Procedia-Social and Behavioral Sciences*, 234-240).

Vahanvati, M., & Mulligan , M. (2017). A new model for effective post-disaster housing reconstruction: Lessons from Gujarat and Bihar in India. *International journal of project management, 35*(5), 802-817.

Van Wassenhove, L. N. (2006). Humanitarian aid logistics: supply chain management in high gear. *Journal of the Operational research Society, 57*(5), 475-489.

Vitoriano, B., Ortuno, M. T., Tirado, G., & Montero, J. (2011). A multi-criteria optimization model for humanitarian aid distribution. *Journal of Global optimization 51*, 189-208.

Voorhees, C. M., Brady, M. K., Calantone, R., & Ramirez, E. (2016). Discriminant validity testing in marketing: an analysis, causes for concern, and proposed remedies. *Journal of the academy of marketing science, 44*, 119-134.

Walton, R., Mays, R. E., & Haselkorn, M. P. (2011). *Defining fast: factors affecting the experience of speed in humanitarian logistics. ISCRAM*.

Wankmuller, C., & Reiner, G. (2020). Coordination, cooperation and collaboration in relief supply chain management. *Journal of Business Economics*, 239-276.

Wankmuller, C., & Reiner, G. (2021). Identifying challenges and improvement approaches for more efficient procurement coordination in relief supply chains. *Sustainability, 13*.

Whiting, M. C., & Ayala-Ostrom, B. E. (2009). Advocacy to promote logistics in humanitarian aid. *Management Research News, 32*(11), 1081-1089.

Wood, D. F., Barone, A., Murphy, P., & Wardlow, D. L. (1995). Logistics of famine relief. *International Logistics*, 325-338.

World Bank. (2016). Retrieved October 23, 2023, from https://www.worldbank.org/en/news/press-release/2016/11/14/natural-disasters-force-26-million-people-into-poverty-and-cost-520bn-in-losses-every-year-new-world-bank-analysis-finds#:~:text=MARRAKESH%2C%20November%2014%2C%202016%E2%80%93%20The%20impact%20of

Yadav, D. K., & Barve, A. (2015). Analysis of critical success factors of humanitarian supply chain: An application of Interpretive Structural Modeling. *International journal of disaster risk reduction, 12*, 213-225.

Yadav, D. K., & Barve, A. (2018). Segmenting critical success factors of humanitarian supply chains using fuzzy DEMATEL . *Benchmarking: An International Journal 25(2)*, 400-425.

Zhou, Q., Huang, W., & Zhang, Y. (2011). Identifying critical success factors in emergency management using a fuzzy DEMATEL method. *Safety science, 49(2)*, 243-252.

Zohrabi, M. (2013). Mixed method research instruments, validity, reliability and reporting findings. *Theory and practice in language studies 3(2)*, 254-262.

APPENDIX

QUESTIONNAIRE

Thesis Survey Questionnaire

Study on exploring the critical success factors in humanitarian supply chain: A Multiple Regression Analysis

As a partial fulfillment of MBA International Logistics & Supply Chain Management at Mae Fah Luang University in Thailand. My research topic is exploring the critical success factors of humanitarian supply chain at the operational level: a case study of Nigeria**.** The main aim of the research is to create an understanding of the relationship between the critical success factors (CSFs) and performance of humanitarian logistics at the operational level so that managers can pay more attention to them.

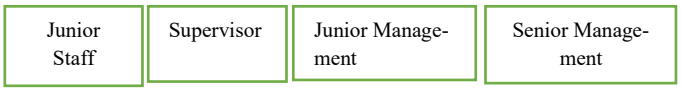
Therefore, I am counting on you to kindly participate in this research by completing this questionnaire. Your feedback will provide valuable information regarding the critical success factors at the operational level in the humanitarian supply chain. Once completed, the study will certainly benefit all humanitarian stakeholders, especially decision – makers and improve the overall performance of relief aid operations.

This research is being undertaken in accordance with ethical procedure of the Mae Fah Luang University. All the responses to this survey will remain confidential to the study team at Mae Fah Luang.

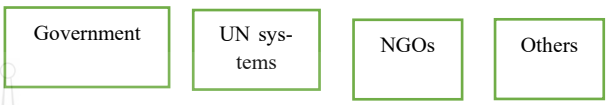
Thank you for your valuable time.

Part A: Respondent Information

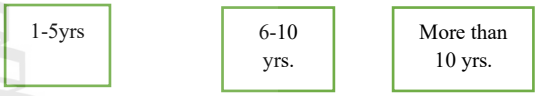
1. What is your job title?



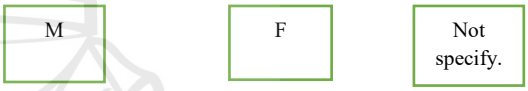
2. Type of Institution



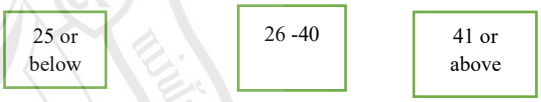
3. Working experience (years)



4. Gender



5. Age



6. Qualification

Part B: Questions related to the research.

Please carefully read the listed points and indicate your choices by ticking on the appropriate cell that best describes your opinion. Where; 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree. Please indicate the degree to which you agree with the following statements about the critical factors at the operational level in humanitarian supply chain in Nigeria.

	Critical success factors	Strongly disagree (1)	Dis-a-gree (2)	Neu-tral (3)	Agree (4)	Strongly agree (5)
	Engagement of suppliers at an early stage To what extent do you agree on the following statements about engagement of a supplier at an early stage on the performance of humanitarian logistics?					
1	Engagement of suppliers at an early stage reduces the risk of shortage and overstocking					
2	Engagement of suppliers at an early stage enhances cost efficiency that improves overall disaster response					
3	Engagement of suppliers at an early stage enables better coordination that guarantees the supply of aid					
	Assessment accuracy. To what extent do you agree on the following statements about assessment accuracy on the performance of humanitarian logistics?					
4	Assessment accuracy enables humanitarian organizations to understand the needs of					

	beneficiaries and respond accordingly.					
5	Assessment accuracy enables humanitarian organizations to determine goals and solutions based on the nature, size, and magnitude of the disaster.					
6	Assessment accuracy determines the number of resources that humanitarian organization can mobilize					
	Degree of information sharing To what extent do you agree on the following statements about the degree of information sharing on the performance of humanitarian logistics?					
7	Degree of information ensures that the 7Rs (right goods, right time, right place, right source, right cost, right condition, and right quality) are achieved.					
8	Degree of information sharing builds higher levels of relationship, provides capabilities to improve quality, reduce cost, and risk of disruption					
9	Degree of information sharing improves materials flow to avoid duplication of efforts and wastage of valuable resources.					
10	Degree of information sharing enables timely sharing of appropriate and relevant information to humanitarian actors in a response operation					
11	Sharing of timely and quality information helps to achieve resilience					
	Speed of delivery To what extent do you agree on the following statements about speed of delivery on the					

	performance of humanitarian logistics?					
12	Speed of delivery allows humanitarian organizations to get to the disaster area at the shortest time to save more lives and alleviate suffering.					
13	Speed of delivery reduces the time lapsed from the start of the disaster and the arrival of the supplies from the organization to the site.					
14	Speed of delivery ensures close communication between logistics team and the field requestors					
	Quality and availability of relief items To what extent do you agree on the following statements about quality and availability of relief items on performance of humanitarian logistics?					
15	Quality and availability of relief items ensure that humanitarian organizations identify key features that determine the suitability of the goods in the eyes of beneficiaries					
16	Quality and availability of relief items ensure that all victims benefit from aid regardless of race, sex, religion, political alignment, or nationality (neutrality).					
17	Quality and availability of relief items ensure that humanitarian organizations choose the right number and the most effective central and decentralized distribution centers to meet beneficiary demands					
	Cost efficiency					

	To what extent do you agree on the following statements about cost efficiency on the performance of humanitarian logistics					
18	Cost performance enables humanitarian organizations to assess procurement cost strategies (pre-disaster inventory control) against post- disaster acquisition					
19	Cost performance enables humanitarian organizations to assess areas and specific transport means for each disaster type aiming at reducing distribution cost.					
20	Cost performance enables humanitarian organizations to assess the different types of cost related to stock maintenance to reduce inventory cost.					
	Community participation and trust To what extent do you agree on the following statements about community participation and trust in the performance of humanitarian logistics?					
21	Community participation and trust foster ownership, cultural sensitivity, and relevance aid intervention					
22	Community participation and trust Improve community resilient					
23	Community participation and trust motivate freely expression of views					
24	Community participation and trust enhance transparency in decision making and responsibility					
25	Community participation and trust reduces the dissemination					

	of inaccurate information to the affected population					
	Security of relief items during transport and distribution To what extent do you agree on the following statements about security of relief items during transport and distribution on the performance of humanitarian logistics?					
26	Security of relief items during transport and distribution enhances deployment of military at the right locations to reduce the risk of theft and protect relief workers from threat.					
27	Security of relief items during transport and distribution increases trust in humanitarian organization					
28	Security of relief items during transport and distribution eases the process of transparency.					
29	Security of relief items during transport and distribution prevents corruption in aid distribution.					
II	**Performance of Humanitarian Logistics (PHL)**					
	To what extent do you agree on the following statements about the performance of humanitarian logistics?					
30	Logistics always meet lead-times for all goods or services					

	requested for relief aid operations (agility)					
31	Despite uncertainties of demand, better service quality that impact beneficiaries' satisfaction levels is always realized (Agility).					
32	Logistics maximizes effectiveness in reaching the greatest number of beneficiaries while minimizing gaps and waste (Lean)					
33	Most of the time scarce resources are spend efficiently within the allocated budget on each activity (Lean)					
34	Logistic mostly adjust the number of supplies provided to a disaster region in line with the disaster intensity (Flexibility).					
35	The type of goods sent to the disaster regions are sometimes changed in response to beneficiaries demands (Flexibility).					
36	Depending on the environment, political and operational changes, rescheduling delivery dates to suit the needs of the beneficiary is often the case (Flexibility)					

CURRICULUM VITAE

NAME Tony Mendy

EDUCATIONAL BACKGROUND

2019	Diploma Public Procurement Operations Gambia Public Procurement Institute
2018	Certificate Public Procurement Operations Gambia Public Procurement Institute
2014	Bachelor of Science Economics University of The Gambia

WORK EXPERIENCE

2024-Persent	Procurement Officer National Human Rights Commission
Aug 2023- Dec 2023	Teacher Assistant Mae Fah Luang University
2020-2022/ 2024- Present	Part-Time Lecturer Gambia Public Procurement Institute
2018-2025	Procurement Officer National Disaster Management Agency
2016-2018	Assistant Procurement Officer Ministry of Finance & Economic Affairs

PUBLICATIONS

Mendy, T., Kongbuamai, N., & Yamsa-ard, S. (2023, September). Critical Success Factors for Humanitarian Logistics: A Literature Review. In *2023 International Conference on Decision Aid Sciences and Applications (DASA)* (pp. 34-42). IEEE.