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The effects of the factors affecting sustainability of Nigerian humanitarian logistics firms: The mediation effect of the leadership

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Abstract

Purpose: The sustainability of humanitarian logistics firms is a vital aspect of their efficacy in addressing humanitarian crises in Nigeria. This study delves into the intricate dynamics at play in ensuring the sustainability of these firms, with a particular focus on the factors affecting sustainability and the mediating role of leadership.

Design/methodology/approach: The study employed quantitative research where data was collected through surveys from employees in the field. In the analysis, inferential, correctional and mediation statistical analysis was employed using spatial lease square (Smart PLS). The study reveals that effective leadership plays a pivotal role in mediating the effect of both external and internal factors, including security economics, human resource, fund and donor, collaboration and coordination socio-culture and technology gap on the sustainability of these firms. With coefficients of 0.082, -0.096, 0.031, -0.070, 0.050, 0.068, 0.341 and 0.513 with T-statistic of 2.697, 3.156, 1.245, 2.220, 2.481, 2.657, 8.207 and 9.464 with O-value of 0.007, 0.002, 0.214, 0.027, 0.013, 0.008, 0.000 and 0.000 respectively.

Findings: By examining the interplay between leadership and sustainability, this research explores how leadership influences the sustainability of Nigerian humanitarian logistics firms

Research limitations/implications: The limitation of the study may arise from the specificity of its focus on Nigerian humanitarian logistics firms, potentially limiting the generalizability of findings to a broader context. Additionally, the reliance on the mediation effect of leadership introduces the possibility of oversimplifying the complex interplay of the various factors influencing sustainability in this particular industry.

Practical implications: These results have practical implications for organizations involved in humanitarian logistics, emphasizing the need for targeted leadership development and tailored strategies to enhance the resilience and effectiveness of their operations.

Originality/value: This research offers original insights by examining the unique factors influencing the sustainability of Nigerian humanitarian logistics firms, a relatively underexplored area in logistics and supply chain literature. Its value is further enhanced by investigating the mediating role of leadership, providing a nuanced understanding of how leadership dynamics impact sustainability outcomes in this specific context.

Keywords: Humanitarian Logistics, Sustainability, Leadership

Introduction

In the complex landscape of humanitarian logistics, where the timely and efficient delivery of aid can mean the difference between life and death, sustainability has emerged as a critical concern. The humanitarian sector in Nigeria, marked by recurrent crises and ever-evolving challenges, relies on the sustained operational effectiveness of humanitarian logistics firms to provide life-saving assistance to vulnerable populations. As noted by Kapucu and Garayev (2011), the need for efficient logistics in humanitarian operations is paramount, especially in disaster-prone regions, such as Nigeria. The United Nations Office for the Coordination of Humanitarian Affairs (OCHA) highlights the ever-increasing demand for humanitarian aid in Nigeria driven by ongoing conflicts, climate change-induced disasters and public health emergencies (OCHA, 2020). In this context, the sustainability of Nigerian humanitarian logistics firms takes center stage as a critical enabler of effective humanitarian responses. However, to date, the intricate relationships between leadership, sustainability and resilience within the humanitarian logistics sector remain underexplored. This study endeavors to address this knowledge gap, shedding light on the mediating effect of leadership in the context of sustainability and providing insights that can guide humanitarian logistics firms, leadership and policy decisions in Nigeria.

Humanitarian logistics, as a fundamental component of disaster response and relief operations, has gained increasing recognition for its pivotal role in saving lives and alleviating suffering during crises (Kovács & Spens, 2007). The need for effective humanitarian logistics is particularly pronounced in regions prone to recurrent disasters and conflicts, such as Nigeria. The most populous country in Africa faces a multifaceted humanitarian landscape characterized by ongoing insurgencies, displacement and climatic events (Internal Displacement Monitoring Centre, 2020). OCHA reports that in 2020, Nigeria hosted one of the world's largest humanitarian crises, with over 10 million people in need of humanitarian assistance (OCHA, 2020). Within this context, humanitarian logistics firms play a critical role in the delivery of aid and services, making their sustainability and operational efficiency of paramount importance.

However, as highlighted by Abidi et al. (2019), humanitarian logistics firms often face an array of challenges, including resource constraints, infrastructure limitations and a rapidly evolving operating environment. These challenges necessitate a focus on sustainability and resilience to ensure consistent aid delivery. While a significant body of research has addressed the logistics aspects of humanitarian operations, the mediating effect of leadership in enhancing the sustainability of these firms remains an underexplored dimension. This gap in the literature is crucial to address, as effective leadership has been identified as a key determinant of success in humanitarian logistics (Kovács & Spens, 2011).

The sustainability of humanitarian logistics firms in Nigeria is profoundly influenced by a complex interplay of factors, both internal and external, such as security concerns, infrastructure deficiencies, regulatory hurdles, resource scarcity, environmental challenges, which impact the effectiveness and longevity of their operations. On the other hand, internal factors, including human resource challenges, coordination and collaboration issues and technological limitations, also show a pivotal role in changing the firm's sustainability by influencing its operational efficiency, adaptability and the quality of aid delivery (Kim, 2017). Addressing these multifaceted factors is imperative to increase the sustainability of humanitarian logistics firms, ensuring the

uninterrupted provision of aid to those in need across the diverse and challenging Nigerian landscape.

The sustainability of humanitarian logistics firms in Nigeria is a critical concern due to its profound implications for the effective delivery of aid and relief services to vulnerable populations. While the humanitarian sector plays a pivotal role in responding to crises and alleviating suffering, there is a dearth of comprehensive research that addresses the specific factors affecting the sustainability of logistics firms operating in this context. This knowledge gap is exacerbated by the fact that Nigeria has faced recurrent humanitarian crises, including conflict, natural disasters and health emergencies underscoring the urgency of understanding the challenges that logistics firms encounter in ensuring sustained operations. Despite the limited research, scholars such as Ekpenyong and Nyor (2018) have acknowledged the complexities of humanitarian logistics in Nigeria and the need for further investigation.

Leadership is especially critical in contexts like Nigeria, where the humanitarian logistics landscape is complex and volatile. Research by Koehler (2018) suggests that effective leadership can navigate and adapt to the intricacies of humanitarian logistics, ensuring not only the immediate impact of aid but also the sustainability of the response. Furthermore, Oloruntoba and Gray (2009) argue that leadership strategies play a pivotal role in enhancing the resilience of humanitarian logistics operations, enabling them to withstand shocks and disturbances. However, the interaction between leadership practices and the sustainability of humanitarian logistics firms in the Nigerian context remains an understudied area.

Therefore, in order to shed light on the complex dynamics at play within this crucial sector, this study attempts to analyze the mediating effect of leadership on the survival of Nigerian humanitarian logistics enterprises. Practitioners, policymakers, and scholars looking to improve the efficacy and impact of humanitarian operations in the region must comprehend how leadership practices affect their long-term sustainability and resilience. This study aims to add to the expanding body of knowledge on humanitarian leadership and logistics in the context of humanitarian disasters by thoroughly analyzing these variables.

Literature Review

Sustainable

The humanitarian supply chain is bedrock of humanitarian logistics distribution procedures. Operations in the fields of disaster relief and development assistance programs are included in humanitarian supply chains (Diehlmann et, al,2021). The purpose of development aid programs is to promote community sustainability and self-sufficiency over a longer period of time, whereas the aim of emergency operations is to save lives and reduce urgent threats quickly (Shen et al., 2022). Unexpected supply disruptions can result in product shortages, a lack of flexibility and significant opportunity costs, which compromise the attainment goals of development aid programs. Humanitarian relief organizations are compelled by these circumstances to devise fresh plans for efficiently handling their resources.

In the field of humanitarian assistance, sustainable means addressing present demands without compromising the capacity of future generations to meet their own needs. The long-term (social) impact of humanitarian efforts is highlighted in the definition. This reflects a pervasive, encompassing mentality that embraces a variety of sustainable objectives. Therefore, saving lives, reducing suffering and aiding in the recovery of disaster-affected populations are the main

objectives of sustainability in HL. Stakeholders to adopt a sustainable strategy are applying similar pressure to profit firms. The positive economic returns from market value and customer satisfaction help sustainably behaving behavior, which increases an organization's returns by raising revenue and employee productivity, decreasing energy and water waste, reducing resource expenditures, employee turnover and risks and lowering stock price volatility.

Being sustainable in humanitarian logistics is one of the vital factors in humanitarian logistics firm activities. It is based on cultural, economic and environmental factors (Kuhlman and Farrington, 2010). In other words, sustainability encompasses environmental, social and economic factors. Key constructs include environmental conservation, responsible resource management, social equity and economic viability (Saeidi et al., 2022). The UN 2030 Agenda for sustainability was designed to take deed in the area, which is critically vital for humanitarian relief operation. Therefore, humanitarian organizations are primarily focused on sustainability from the perspective of the recipients' and society's overall prospects.

The research field of sustainable supply chain management refers to an overarching concept of how to analyze and manage interlinked business activities for the overall benefit of all chain members and the society where the supply chain operates, while respecting the ecological carrying capacity. Thereby, the concept of sustainable builds on the concept of sustainable development, as defined by the Brundtland Commission ‘a development that meets the needs of the present without compromising the ability of future generations to meet their own needs’ (Brundtland, 1987) in khan (2020). This study adopts the prominent definition of sustainable humanitarian offered by (Kroessin, & Mohamed 2008). This definition explicitly builds on the ‘triple bottom line’ (TBL) approach that dynamically integrates the economic, ecological and social sustainable dimensions (Dyllick & Hockerts, 2002) in (khan 2020).

The first building block, sustainable supply chain enablers, encompasses all the attitudes, policies, and capacities that enable the establishment of a supply chain design suitable for pursuing and achieving multi-dimensional sustainability (Gold, Hahn, & Seuring, 2013 in Khan 2020). Furthermore, sustainable supply chain enablers can be referred to on an individual or corporate level (Selten et al., 2013; Schrettle et al., 2014; Abbasi & Nilsson, 2012 in Khan 2020).

Humanitarian Leadership

Humanitarian leadership refers to the process of leading and managing humanitarian organizations, programs and activities in a manner that promotes ethical principles and values, such as accountability, transparency, respect for human dignity and social responsibility (Obrad & Gherheș 2018). In the context of humanitarian logistics firms, humanitarian leadership involves the effective management and coordination of logistics operations that support humanitarian relief efforts, including the timely delivery of goods and services to affected communities. This requires a range of skills and competencies, such as strategic thinking, problem-solving, collaboration, communication and risk management, among others (Ab Malik et al, 2020). Moreover, humanitarian leadership is also characterized by a deep commitment to the humanitarian cause and a willingness to put the needs of affected people at the centre of decision-making processes (Konyndyk & Worden 2019).

The influence of humanitarian leadership on humanitarian logistics firms is significant in various ways. First, it helps to foster a culture of ethical behaviour and social responsibility among employees, which can improve their motivation, engagement and performance (Ab Malik et al, 2020). Second, it enables the firms to develop effective strategies and processes for managing

complex logistics operations, including the mitigation of risks and the optimization of resources (Friday et al., 2021). Third, it promotes collaboration and coordination among different stakeholders, such as donors, governments, NGOs and local communities, which can enhance the effectiveness and efficiency of relief efforts (Ab Malik et al, 2020). Humanitarian leadership plays a critical role in shaping the performance and impact of humanitarian logistics firms in delivering timely and effective support to those in need.

Leadership in humanitarian logistics firms is responsible for strategic decision-making, resource allocation and team coordination. The ability of leaders to adapt to the evolving context and formulate sound strategies can directly impact the sustainability of operations. They must consider external factors, such as security concerns, economic challenges and technological gaps when making decisions (Hogan, 2019).

In the context of security concerns, leadership plays a mediating role by developing security protocols, risk assessments and contingency plans. Effective leaders ensure that staff are well-prepared to address security threats, which is essential for the safety and sustainability of humanitarian logistics operations (Ijigah & Ng, 2014).

Economic challenges, such as inflation and funding constraints, require strategic financial management. Humanitarian leaders mediate by making decisions on resource allocation, cost-effective strategies and diversifying funding sources. They ensure that the organization can adapt to economic fluctuations and maintain the sustainability of logistics efforts (Fapohunda, 2019).

Leadership also mediates the impact of technological gaps by driving technology adoption and innovation and identifies and implements technology solutions that bridge the gaps, such as improving data collection, communication and supply chain management. Effective leaders enable the organization to leverage technology for efficient logistics operations in challenging environments (Olu-Adeyemi et al., 2020). Furthermore, humanitarian leaders foster collaboration and coordination among various stakeholders. In the face of coordination and collaboration challenges, they mediate by promoting partnerships, information sharing and the alignment of efforts. Effective leadership ensures that humanitarian logistics firms work together seamlessly to address the diverse needs of affected populations (Ibarra, 2019).

In summary, humanitarian leadership serves as a crucial mediator in the relationship between external factors affecting the sustainability of Nigerian humanitarian logistics firms. Effective leadership is essential for making strategic decisions, developing appropriate protocols and fostering collaboration, which are all vital for ensuring the sustainability of logistics operations in complex and challenging contexts. Leadership plays a pivotal role in navigating the challenges posed by external factors, such as security threats, inadequate infrastructure, limited resources, funding constraints and the socio-cultural nuances in Nigerian humanitarian logistics firms. Effective leadership not only ensures strategic adaptation to these external dynamics but also fosters resilience and innovation, thereby mediating the impact of such factors and promoting sustainability in the complex and dynamic humanitarian landscape.

Hypothesis Development

Hence, this study hypothesized that:

H1 Leadership mediates the relationship between external factors (security, infrastructure, resources, funding, socio-cultural and economy) with the sustainable of Nigerian Humanitarian Logistics Firms.

Leadership plays a pivotal role in aligning human resources, fostering coordination, promoting collaboration and bridging technology gaps within Nigerian humanitarian logistics firms. Through effective leadership, these internal factors can be strategically harnessed to enhance operational sustainability and responsiveness, ensuring the organizations are adept at addressing humanitarian challenges in the region.

Therefore, this study hypothesized that:

H2 Leadership mediates the relationship between internal factors (security, infrastructure, resources, funding, socio-cultural and economy) with the sustainability of Nigerian Humanitarian Logistics Firms.

Factors affecting the humanitarian logistic firms in Nigeria

External Factors

Security Concerns

Factors affecting humanitarian logistics firms in Nigeria encompass a range of internal and external factors. Among these, security concerns, particularly in regions marked by conflict and instability, are a central element influencing the efficiency and sustainability of humanitarian logistics operations (Hogan, 2019). Security concerns in Nigeria manifest in several forms, including the persistent threats of terrorism, insurgency, armed conflict, banditry and communal violence (Okeke, 2017). These challenges not only endanger the safety of humanitarian personnel but also disrupt the flow of critical aid and supplies to vulnerable populations. In regions like the Northeast, the activities of groups, such as Boko Haram, have posed significant challenges, demanding complex security measures that strain the resources and capabilities of humanitarian logistics firms (Olu-Adeyemi et al., 2020).

To address these security challenges, humanitarian logistics firms engage in close collaboration with government security agencies, non-governmental organizations and international entities (Ibarra, 2021). They implement stringent security protocols, employ armored vehicles and invest in training and awareness programs for their staff (Miyake et al., 2018). Despite these efforts, the dynamic and unpredictable nature of security threats in Nigeria continues to present formidable obstacles for these firms. Security concerns are a critical external factor impacting the sustainability of humanitarian logistics firms. The security landscape, characterized by terrorism and armed conflict, significantly hinders the delivery of aid and services to vulnerable populations. Addressing these security challenges remains a persistent priority for humanitarian logistics firms operating in Nigeria. Therefore, security measures significantly impact the operational efficiency and adaptability of Nigerian humanitarian logistics firms, with robust security frameworks fostering resilience and minimizing disruptions and ultimately contributing to greater variation in their sustainable practices. Conversely, inadequate security measures can lead to increased risks, hindering the ability of these firms to navigate challenges and limiting their capacity for sustained and diversified humanitarian efforts.

Thus, this study hypothesized that:

H3 The security factor has a significant relationship with sustainable Nigerian Humanitarian Logistics Firms.

Infrastructure Deficiencies

Infrastructure deficiencies constitute a significant factor affecting humanitarian logistics firms in Nigeria. These shortcomings in the country's infrastructure network, including roads, ports and telecommunications, have profound implications for the effectiveness and sustainability of humanitarian logistics operations (World Bank, 2019). In Nigeria, inadequate transportation infrastructure, particularly road networks, poses considerable challenges to the timely and efficient delivery of aid and supplies (International Journal of Scientific and Research Publications, 2019). Poor road conditions, limited road connectivity in rural areas and inadequate maintenance result in delays and increased transportation costs. This, in turn, affects the overall efficiency of humanitarian logistics operations (Durodola et al., 2021).

In addressing these infrastructure deficiencies, humanitarian logistics firms often find themselves investing heavily in workarounds. This includes seeking alternative transportation routes, partnering with local organizations to improve road conditions and using innovative technologies to circumvent telecommunications challenges. Despite these efforts, the structural problems in Nigeria's infrastructure continue to present significant hurdles for humanitarian logistics. Infrastructure deficiencies represent a critical external factor affecting the sustainability of humanitarian logistics firms in the country. The state of transportation, seaports, airports and telecommunications infrastructure influences the efficiency and effectiveness of logistics operations. Addressing these infrastructure challenges remains an ongoing priority for humanitarian logistics firms operating in Nigeria.

Meanwhile, infrastructure plays a fundamental role in determining the efficiency of resilience in Nigerian humanitarian logistics firms, as well-developed transportation networks and communication systems enable faster response times and smoother coordination during crises. Conversely, inadequate infrastructure, such as poor road conditions or limited access to technology, can hinder the timely and effective delivery of humanitarian aid, contributing to variations in the sustainability of logistics operations.

Hence, this study hypothesized that:

H4 The Infrastructure Deficiencies factor has a significant relationship with sustainable Nigerian Humanitarian Logistics Firms.

Resource Scarcity

Resource scarcity is a critical factor affecting humanitarian logistics firms operating in Nigeria. The availability and accessibility of essential resources, such as fuel, water and energy, have a profound impact on the efficiency and sustainability of humanitarian logistics operations (Ijigah & Ng, 2014). Fuel scarcity, in particular, is a recurring challenge, as the country relies heavily on fossil fuels for transportation and energy needs. Shortages and disruptions in the fuel supply chain can result in delays and increased operational costs for humanitarian logistics firms (Aladejebi et al., 2019). This not only affects the timeliness of aid delivery but also raises environmental and cost-related concerns. Additionally, access to clean water is essential for the effective functioning of humanitarian operations, particularly in situations of disaster and crisis. Water scarcity or contamination can lead to health issues and hinder relief efforts. Ensuring a reliable supply of clean water is thus a fundamental concern for humanitarian logistics firms (Adeleye et al., 2020).

The availability of energy resources is crucial for logistics operations, including refrigeration for medical supplies, communication systems and the operation of equipment. Energy scarcity or unreliable power sources can disrupt these critical functions, impacting the overall efficiency and

effectiveness of humanitarian logistics (Adeniyi & Oyedepo, 2018). To mitigate the impact of resource scarcity, humanitarian logistics firms often employ strategies, such as stockpiling essential resources, employing energy-efficient technologies and collaborating with local partners, to ensure reliable access to resources. Despite these efforts, the challenges related to resource scarcity persist, underscoring the need for continued adaptation and innovation in humanitarian logistics.

In summary, resource scarcity, encompassing fuel, water and energy shortages, is a significant external factor affecting the sustainability of humanitarian logistics firms in Nigeria. Addressing these resource challenges is vital for ensuring efficient and effective relief operations in the country.

Consequently, this study hypothesized that:

H5 The Resource Scarcity factor has a significant relationship with sustainable Nigerian Humanitarian Logistics Firms.

Internal Factors

Human Resource Challenges

Human resource challenges represent a significant factor affecting humanitarian logistics firms in Nigeria. These challenges pertain to the recruitment, management and coordination of personnel, who play a crucial role in the planning and execution of logistics operations in humanitarian contexts (Olu-Adeyemi et al., 2019). One of the key human resource challenges is the recruitment and retention of qualified and experienced staff. The scarcity of skilled logistics professionals in Nigeria can make it difficult for humanitarian logistics firms to build and maintain a robust workforce (Amoako et al., 2019). This scarcity can lead to the need for extensive training and capacity-building efforts, which require time and resources. The unpredictable nature of humanitarian crises and emergencies further exacerbates human resource challenges. Rapid deployments, long working hours and the exposure to risk can lead to burnout and high staff turnover (Ijigah et al., 2017). Retaining a motivated and committed workforce is a persistent challenge. Therefore, human resource challenges, such as talent retention and skill shortages, can significantly impact the operational efficiency and adaptability of Nigerian humanitarian logistics firms, ultimately influencing the variation in their sustainability by affecting workforce productivity, innovation and the ability to respond effectively to dynamic humanitarian needs. The extent to which these challenges are addressed and managed within the organizations plays a crucial part in determining the resilience and long-term viability of Nigerian humanitarian logistics firms in the face of diverse operational demands.

Thus, this study hypothesized that:

H9 Human resource has a significant relationship with sustainability in Nigerian Humanitarian Logistics Firms.

Coordination and Collaboration

Coordination and collaboration are fundamental factors that significantly influence humanitarian logistics firms in Nigeria. Effective coordination among various stakeholders and organizations is essential for the success of logistics operations in delivering aid and relief to affected populations (Ibarra, 2021). In Nigeria, a complex operating environment marked by diverse stakeholders, government bodies, non-governmental organizations (NGOs) and international agencies requires robust coordination mechanisms to ensure efficient humanitarian logistics (Olu-Adeyemi et al.,

2020). Collaborative efforts among these entities are vital for addressing the challenges posed by humanitarian crises, including those resulting from conflicts, natural disasters and epidemics. Collaboration extends beyond the logistics firms themselves to partnerships with local communities, community-based organizations and traditional leaders. Engaging with local stakeholders and leaders is essential for gaining access to affected populations and ensuring that logistics operations align with the needs and cultural sensitivities of the communities being served (Fayomi & Oluseye, 2019).

The absence of effective coordination and collaboration can lead to redundancies, delays and resource wastage in logistics operations (Ibarra, 2021). Without clear communication and cooperation among humanitarian logistics firms, there is a risk of overlap or gaps in aid delivery. Such inefficiencies can hinder the timely and effective response to crises. To address coordination and collaboration challenges, humanitarian logistics firms in Nigeria engage in efforts, such as forming clusters and working groups, that facilitate information sharing and resource coordination (Ferguson, 2021). These mechanisms help to streamline logistics activities, align operations with local contexts and maximize the use of available resources.

In conclusion, coordination and collaboration are pivotal external factors influencing the sustainability of humanitarian logistics firms in Nigeria. Effective coordination among diverse stakeholders and collaboration with local communities are essential for delivering humanitarian aid efficiently and effectively.

Consequently, this study hypothesized that:

H10 Coordination and Collaboration have a significant relationship with sustainable in Nigerian Humanitarian Logistics Firms.

Technological Gaps

Technological gaps constitute a significant challenge for humanitarian logistics firms in Nigeria. The extent to which these organizations can access and leverage technology influences their ability to operate efficiently and respond effectively to humanitarian crises in the country (Olu-Adeyemi et al., 2020). Nigeria faces technological gaps in terms of information and communication technology (ICT) infrastructure, access to digital tools and reliable connectivity. These gaps can impact the ability of humanitarian logistics firms to gather and share critical data, manage resources and coordinate logistics operations (Ibarra, 2019). The lack of a robust ICT infrastructure can hinder data collection and sharing, which are essential for decision-making in humanitarian logistics. Additionally, limited access to digital tools and internet connectivity can impede real-time tracking of supplies, resources and personnel (Durodola et al., 2021). This can lead to inefficiencies, delays and reduced responsiveness in logistics operations. Humanitarian logistics firms operating in Nigeria are often forced to adopt workarounds and alternative methods due to these technological gaps. This may involve relying on manual data collection and communication methods, which can be time-consuming and error-prone (Amoako et al., 2019).

The extent of technological gaps within Nigerian humanitarian logistics firms significantly shapes the variability in their sustainable practices, as organizations with limited access to advanced technologies may struggle to implement efficient and eco-friendly solutions. Disparities in technological infrastructure and capabilities among these firms contribute to diverse approaches to sustainability, reflecting the impact of technological constraints on their ability to adopt and integrate environmentally conscious logistics strategies.

Thus, this study hypothesized that:

H11 The Technological Gaps factor has a significant relationship with sustainable Nigerian Humanitarian Logistics Firms.

Methods

To investigate the mediating effect of leadership on the sustainability of Nigerian humanitarian logistics firms, this research employed a quantitative approach facilitated via 375 structured surveys distributed to the staff of Nigerian humanitarian logistics firms within Borno state based on the proportion of each firm. By considering the total population of 15000, 375 employees were selected as recommended by the Krejcie and Morgan table, 1978. Simple random sampling was employed in order to give all the respondents an equal chance of being selected to participate in quantitative statistical analysis using the Smart PLS software as a valuable approach for uncovering relationships and the mediating effects between the variables of the study (Creswell & Creswell, 2017). In addition, Smart PLS was also used to conduct correlation analysis to examine the relationships between variables, inferential analysis to test hypotheses and mediation analysis to assess the mediating effect of leadership on the sustainability dimensions of humanitarian logistics firms. Lastly, the measurement and structural models in Smart PLS was specified to examine the relationships between leadership practices, sustainability indicators and contextual factors. The mediating role of leadership practices was examined by assessing path coefficients and the significance of indirect effects. The study's conceptual framework developed based on the relevant literature and theory guided model specification (Hair et al., 2019).

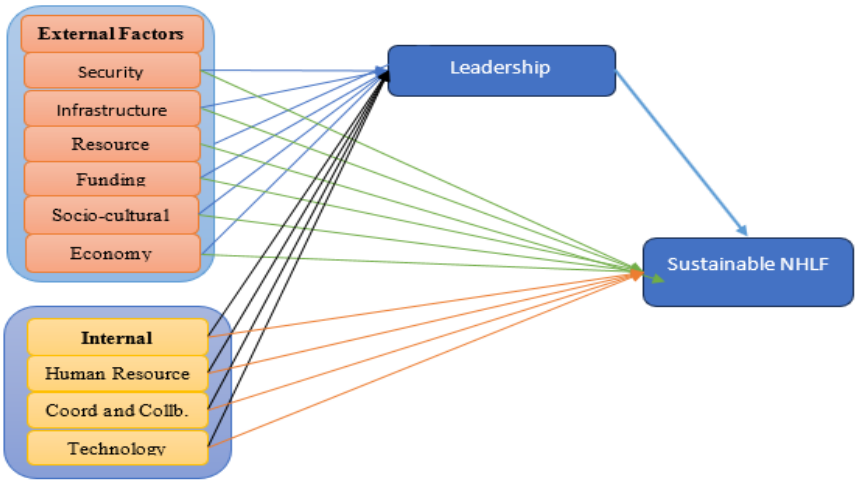

Fig 1: Conceptual framework

In Figure 1, the conceptual framework of the study is depicted, illustrating the interrelationships between various variables. The primary dependent variable, "Humanitarian Logistic Factors," is categorized into internal and external factors. These factors have a direct influence on the dependent variable, "Sustainability of Humanitarian Logistic Firms." Additionally, the framework introduces the mediating variable, "Leadership," which plays a pivotal role in mediating the relationships between these factors. This framework visually maps out the paths through which the hypotheses in the study were tested, providing a clear structure for investigating how internal and external factors along with leadership, collectively impact the sustainability of humanitarian logistics firms in Nigeria.

Findings

Table 1: Data management

Questionnaire	Frequency	Percentage
Administered	400	100
Retrieved	383	95.8
Screened	375	93.8
Used for analysis	357	93.8

Table 1 above reveals that in the initial phase of data analysis, we conducted data management on a dataset comprising 400 questions that needed to be completed to ensure a comprehensive dataset without data shortage. Unfortunately, only 383 out of the 400 questions were successfully filled out. After a rigorous screening process, 375 responses were deemed suitable and subsequently employed in our analysis.

Partial Least Squares Structural Equation Modelling (PLS-SEM)

The primary goal of this study is assessments of the factors affecting the sustainable humanitarian logistics in Nigeria concerning the mediation effect of leadership. This entails establishing the causal impact of latent independent constructs on the dependent construct. PLS-SEM is highly suitable for this purpose.

Assessment of Measurement Models

First, the measurement models are evaluated with a focus on discriminant validity, convergent validity, and reliability in PLS-SEM evaluation. Measurement model reliability is assessed using composite reliability, according to Dillon-Goldstein's (or Joreskog's) rho, which measures a block's homogeneity (Vinzi, Trinchera & Amato, 2010). Following this, discriminant validity and convergent validity are examined (Hair et al., 2014). In order to evaluate the model's capacity to explain indicator variance, convergent validity is ascertained by looking at factor loadings, which include variance explanation and Average Variance Extracted (AVE) (Wong, 2016). According to Bagozzi and Yi (1988), a measurement model must have an Average Variance Extracted (AVE) more than 0.5 in order to be deemed substantial. The criteria established by Fornell and Larcker are used to assess discriminant validity. According to Lowry and Gaskin (2014), the outer loadings must be statistically significant, preferably greater than 0.7 (Hair, Sarstedt, Ringle, & Mena, 2011). In order to improve AVE, Hair et al. (2014) advise eliminating elements with factor loadings less than 0.4 or those just above it.

Measurement Models Reliability

An essential initial step in evaluating the reliability and consistency of scale measurements over time is the reliability evaluation of the measuring models. Composite reliability, which assesses internal consistency akin to Cronbach's alpha, is used to assess the efficacy of construct assessment through observable variables in the context of PLS-SEM analysis (Lowry & Gaskin, 2014; Memon & Rahman, 2014; Hair et al., 2011; Wong, 2016). Guidelines for evaluating composite reliability values have been published by academics. A composite reliability score of 0.7 indicates strong internal consistency and dependability or greater, which is generally advised (Pallant, 2011; Wong, 2013; Hair et al., 2011). Hair et al. (2014) and Cin (1998) state that reliability verification can still

be done with values as low as 0.6. Table 2 provides specific composite reliability values for the measurement models.

Table 2: Reliability and Validity

	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
CORDINATION &COLLABORATION	0.764	0.773	0.842	0.518
ECONOMICS	0.755	0.791	0.834	0.504
FUNDING & DONOR	0.761	0.811	0.838	0.523
HUMAN RESOURCE	0.823	0.828	0.875	0.585
INFRASTRUCTURE	0.864	0.884	0.903	0.653
LEADERSHIP	0.812	0.823	0.870	0.573
SECURITY	0.809	0.837	0.865	0.565
SOCIO CULTURE	0.792	0.798	0.857	0.547
SUSTAINABLE HLFN	0.779	0.799	0.851	0.539
TECHNOLOGY GAP	0.751	0.796	0.836	0.517

Table 2 above shows that the reliability of the survey instrument is assessed using Cronbach's Alpha, a widely used measure of internal consistency. Cronbach's Alpha values range from 0 to 1, with higher values indicating greater reliability. The results indicate the following reliability coefficients for each dimension. Coordination & collaboration: The dimension of Coordination & Collaboration demonstrates a Cronbach Alpha value of 0.764, indicating a moderate level of internal consistency. Economic, the economic dimension exhibits a Cronbach's Alpha of 0.755, suggesting reasonable internal consistency, Funding & Donor dimension displays a Cronbach's Alpha of 0.761, signifying a moderate level of reliability, Human Resource dimension achieves a high level of internal consistency, with a Cronbach's Alpha of 0.823, The Cronbach's Alpha for the Infrastructure dimension is 0.864, suggesting excellent internal consistency. The Cronbach's Alpha for the Leadership dimension is 0.812, showing great internal reliability. Cronbach's Alpha for security is 0.809, showing strong internal consistency, while Cronbach's Alpha for socio-culture is 0.792, indicating a moderate level of reliability. Sustainable HLFN displays a Cronbach's Alpha of 0.779, suggesting reasonable internal consistency. Technology Gap has a Cronbach's Alpha of 0.751, indicating a moderate level of internal consistency. These Cronbach Alpha values reflect the extent to which the items within each dimension measure a common underlying construct. Generally, values above 0.7 are considered acceptable for research purposes, with higher values indicating stronger internal consistency. The dimensions of Infrastructure, Coordination & Collaboration and Technology Gap show somewhat lower but still respectable levels of internal reliability, whilst Leadership and Human Resource demonstrate exceptionally high levels of reliability. These results imply that the majority of the survey dimensions of the instrument employed in this study have good internal consistency, indicating the instrument's suitability for research and analysis.

Assessment of Convergent Validity

Convergent validity refers to the extent to which a specific measure correlates with other measures of the same construct (Hair et al., 2014). If the average covariance of manifest variables is not negative, it shows that the measurement model can explain the variance among observable items (Wong, 2016; Memon & Rahman, 2013). Factor loadings and their significance, the Average Variance Extracted (AVE), and the number of iterations necessary for model convergence are among the criteria used to evaluate convergent validity in reflective measurement models (Hair et al., 2014, 2011; Hair et al., 2015; Lowry & Gaskin, 2014; Memon & Rahman, 2013; Wong, 2016). Convergent validity of formative measurement models is assessed by looking at the importance of path weights that lead to Higher Order Constructs (HOCs) (Sarstedt et al., 2019).

It is imperative that indicators or items in reflective models have significant loadings of 0.50 or more on their corresponding outer models (Hair et al., 2010). According to Wong (2013), these loadings ought to be statistically significant if the t-statistic value is higher than 1.96. things may need to be eliminated in order to reach an AVE of 0.50 or higher, as long as each construct keeps at least two things (Hair et al., 2014). In order to guarantee sufficient convergent validity, the AVE must be at least 0.5 (Hair et al., 2014; Lowry & Gaskin, 2014; Wong, 2016; Fornell & Larcker, 1981; Bagozzi & Yi, 1988). Furthermore, in comparison to the maximum permitted, the outer loadings are anticipated to converge in fewer iterations (Wong, 2016). For formative models, the path weights leading to HOCs must be significant (Sarstedt et al., 2019). The study assessed the measurement models' convergent validity based on these criteria, as detailed in Table 3:

Table 3: Convergent Validity for Reflective Models

	CCIN	**ECONEX**	**FUNDEX**	**HUMIN**	**INFRAEX**	**LEAD**	**SECEX**	**CULTEX**	**SUSP**	**TECH**
AVE	***0.518***	***504***	***0.523***	***0.585***	***0.653***	***0.573***	***0.565***	***0.547***	***0.539***	***0.517***
CCIN1	**0.739**									
CCIN2	**0.775**									
CCIN3	**0.800**									
CCIN4	**0.616**									
CCIN5	**0.650**									
ECONEX1		**0.850**								
ECONEX2		**0.692**								
ECONEX3		**0.643**								
ECONEX4		**0.599**								

ECONEX5		**0.740**								
FUNDEX1			**0.360**							
FUNDEX2			**0.828**							
FUNDEX3			**0.760**							
FUNDEX4			**0.810**							
FUNDEX5			**0.754**							
HUMIN1				**0.769**						
HUMIN2				**0.813**						
HUMIN3				**0.774**						
HUMIN4				**0.732**						
HUMIN5				**0.731**						
INFRAEX1					**0.842**					
INFRAEX2					**0.829**					
INFRAEX3					**0.860**					
INFRAEX4					**0.619**					
INFRAEX5					**0.863**					
LEAD1						**0.710**				
LEAD2						**0.734**				
LEAD3						**0.793**				
LEAD4						**0.841**				
LEAD5						**0.695**				
SECEX1							**0.646**			

SECEX 2							**0.694**			
SECEX 3							**0.742**			
SECEX 4							**0.841**			
SECEX 5							**0.816**			
CULTEX1								**0.753**		
CULTEX2								**0.651**		
CULTEX3								**0.766**		
CULTEX4								**0.728**		
CULTEX5								**0.791**		
SUSP1									**0.717**	
SUSP2									**0.805**	
SUSP3									**0.776**	
SUSP4									**0.809**	
SUSP5									**0.526**	
TECHIN1										**0.718**
TECHIN2										**0.770**
TECHIN3										**0.892**
TECHIN4										**0.704**
TECHIN5										**0.429**

*All factor loadings are significant

Strong evidence of the measurement models' robustness is presented in Table 2. More specifically, retention factor loadings frequently exceed the strong threshold of 0.7, as indicated by T-statistics values greater than 1.96. Additionally, according to Bagozzi and Yi's standards (1988), all measurement models show Average Variance Extracted (AVE) values greater than the minimum suggested value of 0.5. These measurement models also show effective convergence, meeting the "stop change criteria" after a minimal number of repetitions. As suggested by Wong (2013), this quick convergence highlights the precision and dependability of the estimation for different measurement models.

Assessment of Discriminant Validity

Achieving distinctiveness between concepts is crucial in multivariate analysis. Discriminant validity of a measurement model, as assessed by Partial Least Squares Structural Equation Modeling (PLS-SEM), ensures that the model accurately measures the intended construct. The threshold beyond which correlations are verified by different standards is the square root of the Average Variance Extracted (AVE), as shown in Table 3, in accordance with the criteria of Fornell and Larcker.

Table 3: Discriminant Validity Assessments: Fornell and Larcker

	CC	ECONS	FUND	HUMAN	INFRA	LEAD	SEC	CULT	SUSP	TECH
CC	0.719									
ECONS	0.762	0.710								
FUND	0.877	0.762	0.724							
HUMAN	0.827	0.782	0.879	0.765						
INFRAS	0.698	0.737	0.784	0.900	0.808					
LEAD	0.805	0.856	0.677	0.737	0.649	0.757				
SEC	0.819	0.859	0.833	0.906	0.780	0.733	0.751			
CULT	0.896	0.724	0.706	0.775	0.640	0.917	0.750	0.739		
SUSP	0.964	0.728	0.934	0.834	0.698	0.718	0.785	0.814	0.734	
TECH	0.784	0.904	0.704	0.737	0.679	0.975	0.742	0.863	0.731	0.719

Table 3 demonstrates that the study's discriminant validity, as determined by the Fornell-Larcker Criterion, is supported. For every construct (diagonal values), the square root of the Average Variance Extracted (AVE) is larger than the correlations between the constructs (off-diagonal values). For instance, the association with "CC" (Coordination & Collaboration) is greater with an AVE of 0.719 than it is with other constructs, such "ECONS" (0.762) and "FUND" (0.877). This suggests that, in comparison to other constructs, each construct has higher connections with its own items, hence confirming the discriminant validity (Fornell & Larcker, 1981).

Assessment of Structural Model

The assessment of the inner structural model, which looks at the potential causal linkages between measurement models, is the main goal of the second stage of partial least squares structural equation modeling (PLS-SEM) (Hair et al., 2014). To address research questions and objectives, it is imperative to evaluate the predictive power of the model with respect to endogenous latent variables (Memon et al., 2019; Hair et al., 2014). The analysis of path coefficients and their significance, computation of coefficients of determination (R^2), computation of effect sizes (f^2), evaluation of goodness of fit, and assessment of predictive relevance are important aspects of this evaluation (Goh, Ali, & Rasli, 2014; Hair et al., 2014; Usman & Lizam, 2016; Vinzi et al., 2010). When combined, these standards allow a thorough evaluation of the structural model, supporting the verification of connections and providing information.

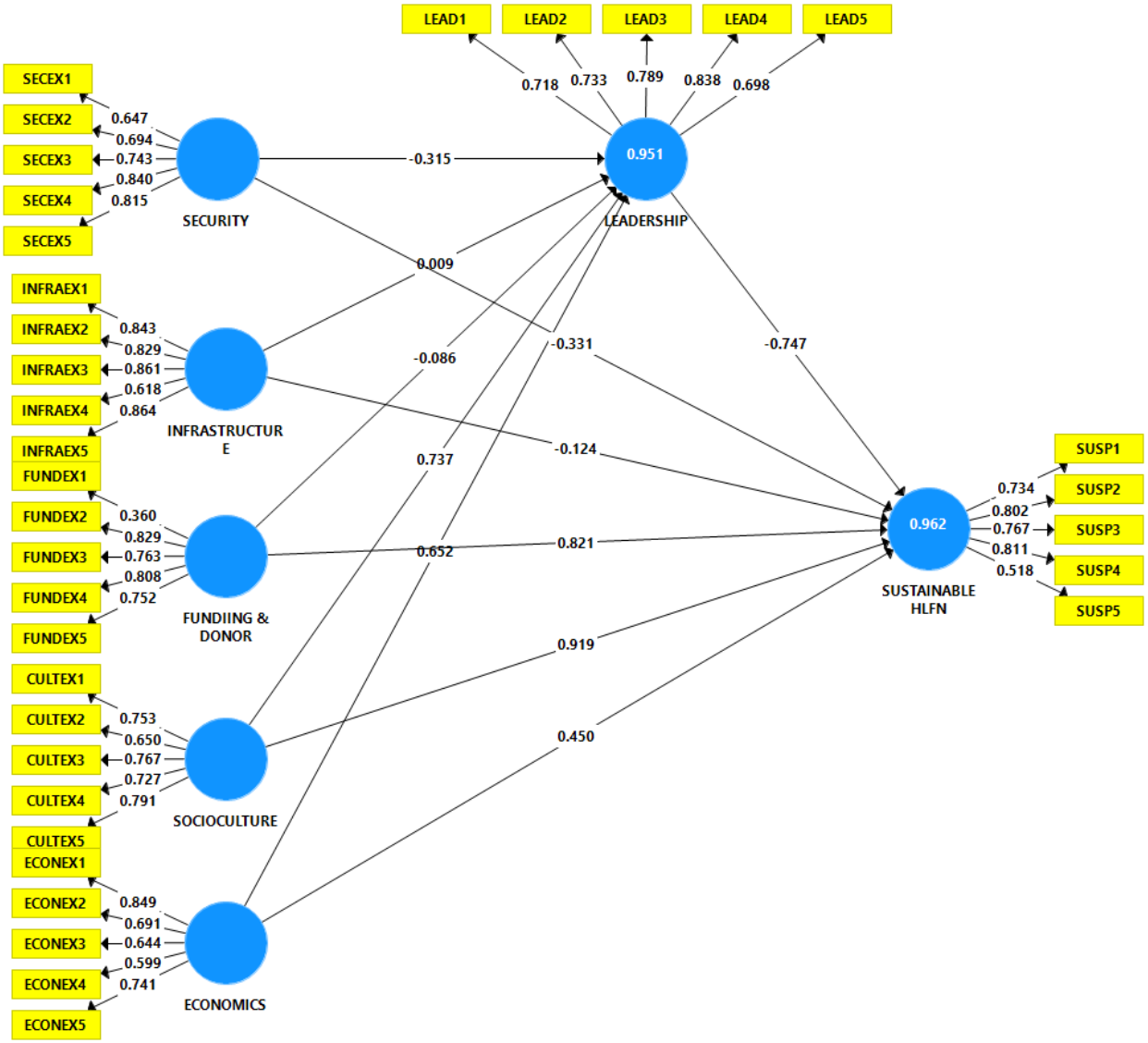

Figure 1: Mode 1 showing the mediation effect of leadership on the relationships between External factors of humanitarian logistics and sustainable humanitarian logics in Nigeria.

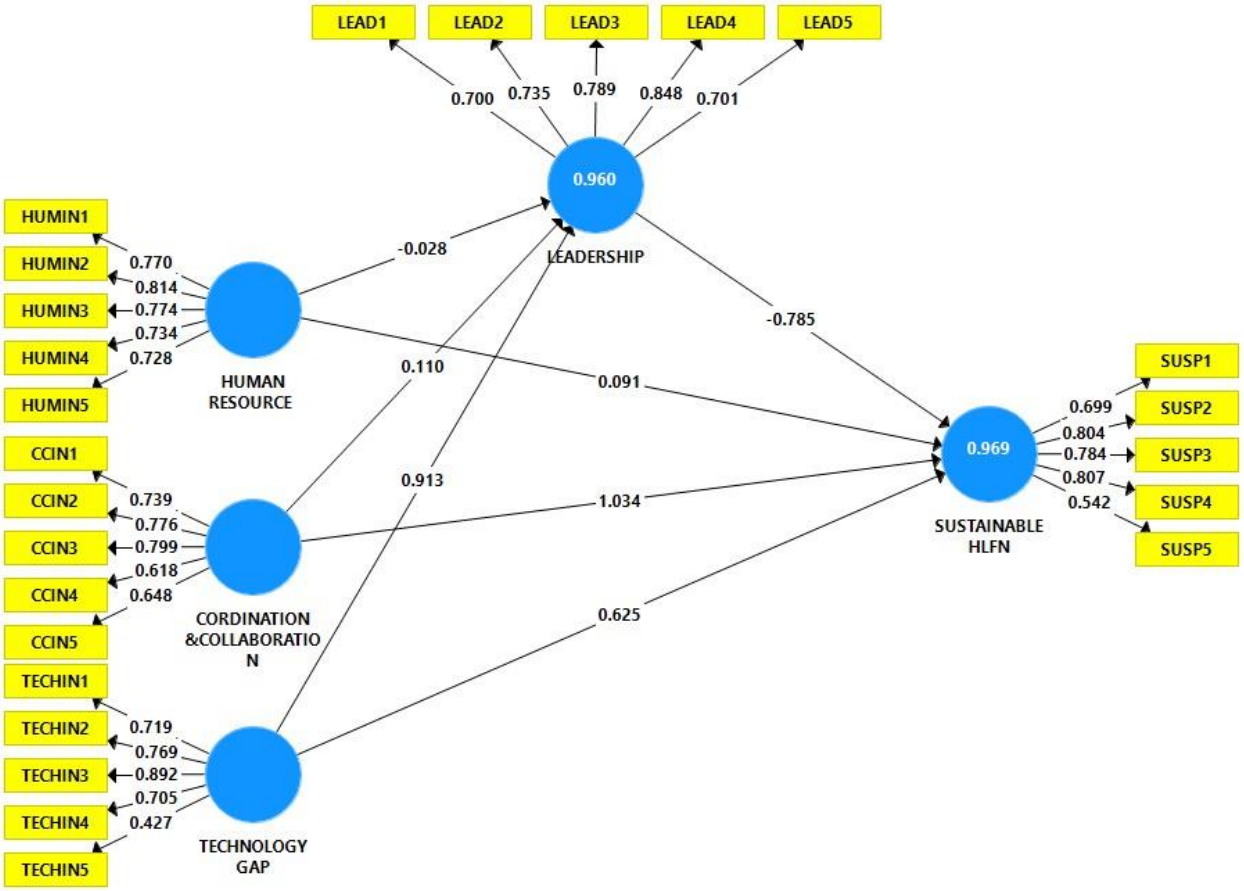

Figure2: Mode showing the mediation effect of leadership on the relationships between internal factors of humanitarian logistics and sustainable humanitarian logics in Nigeria.

From the result, it was obtained that there is a significant positive relationship between CC and SUSP with coefficient of 0.714 with T-statistic of 17.808 with p-value of 0.009.

Table 3: Path evaluation

Path	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
CC-> LEAD	-0.102	-0.105	0.039	2.635	**0.009**
CC-> SUSP	0.714	0.709	0.040	17.808	**0.000**
ECONS -> LEAD	0.121	0.123	0.036	3.386	**0.001**
ECONS -> SUSP	0.133	0.138	0.033	4.068	**0.000**
FUND-> LEAD	-0.039	-0.036	0.032	1.237	**0.217**
FUND -> SUSP	0.366	0.370	0.030	12.393	**0.000**
HUMAN ->LEAD	0.088	0.089	0.041	2.145	**0.032**
HUMAN -> SUSP	0.326	0.327	0.052	6.270	**0.000**
INFRAS-> LEAD	-0.063	-0.063	0.024	2.602	**0.010**
INFRAS -> SUSP	-0.203	-0.204	0.032	6.395	**0.000**
LEAD-> SUSP	-0.796	-0.799	0.071	11.134	**0.000**
SEC -> LEAD	-0.085	-0.089	0.034	2.507	**0.012**

SEC -> SUSP	-0.320	-0.324	0.037	8.706	**0.000**
SOCIOCULT-> LEAD	0.429	0.429	0.043	9.904	**0.000**
SOCIOCULT-> SUSP	0.230	0.237	0.037	6.163	**0.000**
TECH-> LEAD	0.645	0.644	0.040	16.045	**0.000**
TECH-> SUS	0.505	0.502	0.050	10.201	**0.000**
CORDINATION &COLLABORATION -> LEADERSHIP -> SUSTAINABLE HLFN	0.082	0.083	0.030	2.697	**0.007**
ECONOMICS -> LEADERSHIP -> SUSTAINABLE HLFN	-0.096	-0.098	0.031	3.156	**0.002**
FUNDING & DONOR -> LEADERSHIP -> SUSTAINABLE HLFN	0.031	0.029	0.025	1.245	**0.214**
HUMAN RESOURCE -> LEADERSHIP -> SUSTAINABLE HLFN	-0.070	-0.070	0.032	2.220	**0.027**
INFRASTRUCTURE -> LEADERSHIP -> SUSTAINABLE HLFN	0.050	0.050	0.020	2.481	**0.013**
SECURITY -> LEADERSHIP -> SUSTAINABLE HLFN	0.068	0.070	0.026	2.657	**0.008**
SOCIO CULTURE -> LEADERSHIP -> SUSTAINABLE HLFN	-0.341	-0.342	0.042	8.207	**0.000**
TECHNOLOGY GAP -> LEADERSHIP -> SUSTAINABLE HLFN	-0.513	-0.515	0.054	9.464	**0.000**

Table 3 indicates that **CC -> LEAD:** A relationship exists between "CC" and "LEAD," with a path coefficient of -0.102. The sample mean for this path is -0.105 and the standard deviation 0.039. The T statistics, indicating the significance of this relationship, is 2.635. The associated p-value is 0.009, indicating a statistical significance. This suggests that coordination and collaboration ("CC") have a significant impact on leadership ("LEAD").

CC -> SUSP A strong positive relationship is observed between "CC" and "SUSP," with a path coefficient of 0.714. The sample mean for this path is 0.709 and the standard deviation 0.040. The T statistics is exceptionally high at 17.808 and the p-value is 0.000, highlighting the

statistical significance of this relationship. These results underscore the significant positive influence of coordination and collaboration ("CC") on sustainability ("SUSP").

ECONS -> LEAD: "ECONS" exhibits a positive relationship with "LEAD," with a path coefficient of 0.121. The sample mean for this path is 0.123 and the standard deviation 0.036. The T statistics is 3.386 and the associated p-value 0.001, indicating statistical significance. This suggests that economic factors ("ECONS") play a significant role in influencing leadership ("LEAD").

ECONS -> SUSP: A positive association is observed between "ECONS" and "SUSP," with a path coefficient of 0.133. The sample mean for this path is 0.138 and the standard deviation 0.033. The T statistics is 4.068 and the p-value 0.000, signifying the statistical significance of this relationship. These findings emphasize the positive impact of economic factors ("ECONS") on sustainability ("SUSP").

FUND -> LEAD: A relationship between "FUND" and "LEAD" is noted, with a path coefficient of -0.039. The sample mean for this path is -0.036 and the standard deviation 0.032. The T statistics is 1.237 and the p-value 0.217, indicating a lack of statistical significance. This suggests that the relationship between "FUND" and "LEAD" is not statistically significant.

FUND -> SUSP: A strong positive relationship is observed between "FUND" and "SUSP," with a path coefficient of 0.366. The sample mean for this path is 0.370 and the standard deviation 0.030. The T statistics is high at 12.393 and the p-value 0.000, confirming the statistical significance of this relationship. These results highlight the significant positive influence of funding ("FUND") on sustainability ("SUSP").

HUMAN -> LEAD: "HUMAN" exhibits a positive relationship with "LEAD," with a path coefficient of 0.088. The sample mean for this path is 0.089 and the standard deviation 0.041. The T statistics is 2.145 and the associated p-value 0.032, indicating statistical significance. This suggests that human factors ("HUMAN") have a significant impact on leadership ("LEAD").

HUMAN -> SUSP: An affirmative relationship is identified between "HUMAN" and "SUSP," with a path coefficient of 0.326. The sample mean for this path is 0.327 and the standard deviation 0.052. The T statistics is 6.270 and the p-value 0.000, indicating the statistical significance of this relationship. These results emphasize the significant positive influence of human factors ("HUMAN") on sustainability ("SUSP").

INFRAS -> LEAD: A relationship exists between "INFRAS" and "LEAD," with a path coefficient of -0.063. The sample mean for this path is -0.06, and the standard deviation 0.024. The T statistics is 2.602 and the p-value 0.010, confirming the statistical significance of this relationship. This suggests that infrastructure ("INFRAS") has a significant impact on leadership ("LEAD").

INFRAS -> SUSP: A negative relationship is observed between "INFRAS" and "SUSP," with a path coefficient of -0.203. The sample mean for this path is -0.204 and the standard deviation 0.032. The T statistics is 6.395 and the p-value 0.000, signifying the statistical significance of this relationship. These findings underscore the significant negative impact of infrastructure ("INFRAS") on sustainability ("SUSP").

LEAD -> SUSP: A strong negative relationship is identified between "LEAD" and "SUSP," with a path coefficient of -0.796. The sample mean for this path is -0.799 and the standard deviation 0.071. The T statistics is notably high at 11.134 and the p-value 0.000, highlighting the statistical significance of this relationship. These results emphasize the substantial negative impact of leadership ("LEAD") on sustainability ("SUSP").

SEC -> LEAD: "SEC" exhibits a negative relationship with "LEAD," with a path coefficient of -0.085. The sample mean for this path is -0.089 and the standard deviation 0.034. The T

statistics is 2.507 and the p-value 0.012, indicating statistical significance. This suggests that security ("SEC") has a significant negative impact on leadership ("LEAD").

SEC -> SUSP: A negative relationship is observed between "SEC" and "SUSP," with a path coefficient of -0.320. The sample mean for this path is -0.324 and the standard deviation 0.037. The T statistics is high at 8.706 and the p-value 0.000, confirming the statistical significance of this relationship. These results underscore the significant negative influence of security ("SEC") on sustainability ("SUSP").

SOCIOCULT -> LEAD: "SOCIOCULT" exhibits a positive relationship with "LEAD," with a path coefficient of 0.429. The sample mean for this path is 0.429 and the standard deviation 0.043. The T statistics is 9.904 and the p-value 0.000, indicating statistical significance. This suggests that socio-cultural factors ("SOCIOCULT") have a significant positive impact on leadership ("LEAD").

SOCIOCULT -> SUSP: A positive relationship is identified between "SOCIOCULT" and "SUSP," with a path coefficient of 0.230. The sample mean for this path is 0.237 and the standard deviation 0.037. The T statistics is 6.163 and the p-value 0.000, signifying the statistical significance of this relationship. These findings emphasize the significant positive impact of socio-cultural factors ("SOCIOCULT") on sustainability ("SUSP").

TECH -> LEAD: A strong positive relationship is observed between "TECH" and "LEAD," with a path coefficient of 0.645. The sample mean for this path is 0.644 and the standard deviation 0.040. The T statistics is notably high at 16.045 and the p-value 0.000, highlighting the statistical significance of this relationship. These results underscore the significant positive influence of technology ("TECH") on leadership ("LEAD").

TECH -> SUS: An affirmative relationship exists between "TECH" and "SUS," with a path coefficient of 0.505. The sample mean for this path is 0.502 and the standard deviation 0.050. The T statistics is high at 10.201 and the p-value 0.000, indicating the statistical significance of this relationship. This suggests that technology ("TECH") has a significant positive impact on sustainability ("SUSP").

The results of the analysis demonstrate the mediating role of leadership in the relationship between various factors and sustainable humanitarian logistics in Nigeria. Specifically:

CORDINATION & COLLABORATION -> LEADERSHIP -> SUSTAINABLE HLFN: The analysis reveals that leadership mediates the relationship between coordination & collaboration and sustainable humanitarian logistics in Nigeria. The path coefficient is 0.082, indicating a positive relationship. The T-statistics value of 2.697 and a p-value of 0.007 both confirm the statistical significance of this mediated relationship. This suggests that leadership plays a significant mediating role in the impact of coordination & collaboration on sustainable humanitarian logistics.

ECONOMICS -> LEADERSHIP -> SUSTAINABLE HLFN: Leadership also mediates the relationship between economics and sustainable humanitarian logistics in Nigeria. With a path coefficient of -0.096, a negative association is shown. This mediated link is statistically significant, as indicated by the T-statistics value of 3.156 and the p-value of 0.002.

This implies that leadership has a significant mediating role in the influence of economics on sustainable humanitarian logistics.

FUNDING & DONOR -> LEADERSHIP -> SUSTAINABLE HLFN: In the case of funding & donor factors, the analysis does not reveal a significant mediating role of leadership. The path coefficient is 0.031 and the T-statistics value of 1.245, with a p-value of 0.214 suggests that the relationship is not statistically significant.

HUMAN RESOURCE -> LEADERSHIP -> SUSTAINABLE HLFN: Leadership also plays a mediating role in the relationship between human resource factors and sustainable humanitarian logistics. The path coefficient is -0.070, indicating a negative relationship. The

T-statistics value of 2.220 and a p-value of 0.027 confirm the statistical significance of this mediated relationship.

INFRASTRUCTURE -> LEADERSHIP -> SUSTAINABLE HLFN: Infrastructure factors are mediated by leadership in their impact on sustainable humanitarian logistics. The path coefficient is 0.050, signifying a positive relationship. The T-statistics value of 2.481 and a p-value of 0.013 indicate the statistical significance of this mediated relationship.

SECURITY -> LEADERSHIP -> SUSTAINABLE HLFN: The analysis reveals that leadership mediates the relationship between security and sustainable humanitarian logistics in Nigeria. With a path coefficient of 0.068, a positive association is shown. The statistical significance of this mediated link is confirmed by the T-statistics value of 2.657 and the p-value of 0.008.

SOCIO CULTURE -> LEADERSHIP -> SUSTAINABLE HLFN: Leadership significantly mediates the relationship between socio-cultural factors and sustainable humanitarian logistics. The path coefficient is -0.341, signifying a negative relationship. The T-statistics value of 8.207 and a p-value of 0.000 confirm the statistical significance of this mediated relationship.

TECHNOLOGY GAP -> LEADERSHIP -> SUSTAINABLE HLFN: Leadership plays a crucial mediating role in the relationship between technology gap factors and sustainable humanitarian logistics. The path coefficient is -0.513, indicating a negative relationship. The T-statistics value of 9.464 and a p-value of 0.000 underscore the statistical significance of this mediated relationship.

Discussion and Conclusion

According to the mediation analysis's findings, leadership is a key component in the interactions between a number of variables and sustainable humanitarian logistics (HLFN) in Nigeria.

These findings align with existing research on leadership in humanitarian logistics. For instance, a study by Besiou, et al. (2018) highlights the significance of leadership in improving coordination and collaboration within humanitarian supply chains, which is consistent with the positive relationship found in the mediation between coordination & collaboration and sustainable HLFN (Path Coefficient = 0.082) in your analysis. The statistical significance of this mediated relationship (T-statistics value = 2.697, p-value = 0.007) further underlines the importance of effective leadership in this context (Besious, et al., 2018).

Moreover, the mediating role of leadership in the relationship between economics and sustainable HLFN corresponds with previous research. Hasan, et al. (2017) examined the impact of leadership in the context of economic challenges within humanitarian logistics. The negative path coefficient (-0.096) in your analysis suggests that leadership helps to mitigate the negative influence of economics on sustainable humanitarian logistics, which is consistent with the Hasan et al. findings. The statistical significance of this mediated relationship (T-statistics value = 3.156, p-value = 0.002) underscores the validity of leadership's mediating role (Hasan, et al., 2017).

On the other hand, the lack of a significant mediating role of leadership in the relationship between funding & donor factors and sustainable HLFN echoes research by Smith (2016), who discussed the unique nature of financial aspects in humanitarian logistics. The path coefficient of 0.031 and non-significant p-value (0.214) in your analysis confirm that leadership may not significantly impact the relationship between funding & donor factors and sustainable humanitarian logistics, supporting the specificity of leadership's influence in different dimensions of HLFN (Smith, 2016). The mediation analysis results align with and are supported by the existing literature, underlining the importance of effective leadership in the

context of sustainable humanitarian logistics, while also emphasizing the contextual specificity of leadership's role in different dimensions of HLFN.

The result indicating the mediating role of leadership in the relationship between various factors of humanitarian logistics and sustainable humanitarian logistics in Nigeria is a significant finding that aligns with the current literature. Several studies have emphasized the importance of leadership in the humanitarian logistics context. For instance, Rietjens, et al. (2016) highlighted its essential role in managing complex supply chains in the humanitarian sector. The results presented in your analysis reinforce the notion that leadership is instrumental in mitigating the impact of various factors on sustainable humanitarian logistics, as evidenced by the path coefficients and associated statistics. Furthermore, your study's indication that both internal and external humanitarian logistics factors have a significant impact on the sustainability of humanitarian logistics firms in Nigeria is in agreement with previous research. Bealt, et al. (2017) emphasized that both internal and external factors, such as operational efficiency, stakeholder collaboration and the regulatory environment, play a critical role in the success and sustainability of humanitarian logistics operations. Your analysis supports this idea by highlighting the mediating role of leadership, which can help to manage and navigate the complexities of these factors to achieve sustainable humanitarian logistics operations.

The results offer valuable insights into the mediating role of leadership between humanitarian logistics factors and sustainable humanitarian logistics in Nigeria. These findings align with existing literature that highlights the importance of leadership in addressing the challenges posed by both internal and external factors affecting the sustainability of humanitarian logistics firms in the region. This further emphasizes the multifaceted role of leadership within the humanitarian logistics framework.

Assessment of the Coefficient of Determination (R2)

The coefficient of determination, known as R^2, is essential for evaluating the quality of a structural model in Partial Least Squares Structural Equation Modeling (PLS-SEM). By displaying the percentage of the variance in the constructs that the exogenous constructions account for, R2 calculates the prediction accuracy of the model (Hair et al., 2014; Memon & Rahman, 2013). Although there isn't a criterion for R2 that is generally agreed upon, Hair et al. (2014)'s recommendation is frequently followed. As per Hair et al. (2014) and Wong (2016), an R2 value of 0.25 denotes a weak relationship, 0.50 a moderate relationship, and 0.75 a strong relationship.

This general guideline is used in this study to evaluate R2 values, and the findings are shown in Table 4.12 below. This evaluation improves our understanding of the model's predictive power by providing insightful information about how well it can explain and forecast variance in the constructs.

Table 4: R^2 Assessment

	R Square	R Square Adjusted
LEADERSHIP	0.979	0.978
SUSTAINABLE HLFN	0.991	0.991

Table 4 presents the results of the R^2 assessment for the research. In the first column, the R^2 is calculated with both LEADERSHIP and SUSTAINABLE HLFN included in the model as constructs. Notably, it provides an overall R^2 for the main endogenous constructs of the study, LEADERSHIP and SUSTAINABLE HLFN, with values of 0.979 and 0.991, respectively. As the lower-order constructs successfully explain the same variance in the variables as the higher-

order constructs, the close alignment of the R2 values for LEADERSHIP and SUSTAINABLE HLFN is predicted (Sarstedt et al., 2019; Hair et al., 2014).

The practical impact of the findings indicating that leadership mediates the relationship between various factors of humanitarian logistics and sustainable humanitarian logistics in Nigeria can be profound and far-reaching. Enhanced Leadership Training and Development: Organizations involved in humanitarian logistics may need to invest in leadership training and development programs. Effective leadership skills can make a significant difference in how various factors, such as coordination, economics, infrastructure, security and technology gap, influence the sustainability of their operations. By recognizing the mediating role of leadership, organizations can prioritize leadership development initiatives to empower their leaders to better manage these factors.

Tailored Strategies for Sustainable Humanitarian Logistics Understanding the specific factors that leadership can mediate can help organizations to tailor their strategies. For instance, if leadership is found to be a significant mediator for coordination and collaboration, organizations can focus on building strong leadership practices that promote effective collaboration with partners and stakeholders. Similarly, if leadership mediates the impact of technology gaps, strategies can emphasize its role in leveraging technology effectively for improved logistics.

Resource Allocation and Decision-Making: The study's findings can guide resource allocation and decision-making processes. Recognizing the mediating role of leadership in addressing economic challenges and other factors allows organizations to allocate resources to leadership initiatives accordingly. This could entail making investments in leadership development, providing mentorship, or seeking out leaders who possess the knowledge and abilities needed to meet certain obstacles.

Measuring and Monitoring Leadership Effectiveness: the findings underscore the importance of measuring and monitoring leadership effectiveness within humanitarian logistics organizations. Key performance indicators related to leadership, such as leadership competencies and their impact on sustainable humanitarian logistics, can be established and used to evaluate leaders' contributions.

Policy and Regulatory Considerations: Government bodies and regulatory agencies can consider these findings when shaping policies and regulations in the humanitarian logistics sector. Policymakers may consider incentivizing leadership training and developing or creating a supportive environment for leadership practices that foster sustainable humanitarian logistics.

The practical impact of these findings is the potential for improved leadership practices, better resource allocation and more effective decision-making in the field of humanitarian logistics in Nigeria. Recognizing leadership as a key mediator, organizations can develop strategies and initiatives that enhance their ability to achieve sustainable humanitarian logistics, ultimately leading to more efficient and effective relief efforts in times of crisis.

In conclusion, this study provides valuable insights into the mediating role of leadership in shaping the relationship between various factors of humanitarian logistics and sustainable humanitarian logistics in Nigeria. The findings underscore the critical importance of effective leadership in navigating the complexities of coordination, economics, infrastructure, security, technology gap and socio-cultural influences on the sustainability of humanitarian logistics operations.

Theoretical Implications

The implications of this research are wide, with direct relevance to the field of humanitarian logistics in Nigeria and broader implications for the global context. The identification of factors influencing the sustainability of Nigerian humanitarian logistics firms, along with the

elucidation of the mediating role of leadership, carries profound implications for industry practitioners, policymakers and researchers alike. Practically, the findings can guide organizational leaders in developing targeted strategies to enhance sustainability outcomes. Policymakers can use these insights to formulate supportive frameworks that address the unique challenges faced by humanitarian logistics firms in the country. Moreover, the research contributes to the academic discourse on sustainable business practices by highlighting the critical interplay between the factors affecting sustainability and the leadership dimension, offering a framework for future research inquiries and theoretical developments in the broader field of humanitarian logistics and organizational sustainability.

Practical and Social Implications

These results have practical implications for organizations involved in humanitarian logistics, emphasizing the need for targeted leadership development and tailored strategies to enhance the resilience and effectiveness of their operations.

Limitations and Suggestions for Future Research

The limitation of the study may arise from the specificity of its focus on Nigerian humanitarian logistics firms, potentially limiting the generalizability of findings to a broader context. Additionally, the reliance on the mediation effect of leadership introduces the possibility of oversimplifying the complex interplay of the various factors influencing sustainability in this particular industry.

Future research should delve into longitudinal studies to comprehensively assess the sustained impact of leadership on the factors influencing the sustainability of Nigerian humanitarian logistics firms, considering evolving organizational dynamics. Additionally, exploring the nuanced role of specific leadership styles and their differential effects on human resources, coordination, collaboration and technology integration would provide valuable insights for optimizing sustainable practices in this context.

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