Building Resilience in Humanitarian Organisations in Zimbabwe: The significance of Information and Communication Technology in Disaster Response

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Abstract

The study aimed to assess the significance of Information and Communication Technology in enhancing supply chain resilience and improve disaster response in humanitarian organisations in Zimbabwe. The population for this study comprised 160 individuals who were purposively selected from the humanitarian organisations that operated in Manicaland, Zimbabwe, where Cyclone Idai took place in 2019. The Yamane formula was used to calculate the sample size of 114 respondents in the study. Structured questionnaires were used as research instruments in the study. The study revealed that Information and Communication Technology was important in humanitarian organisations as it helps to build resilience and improve disaster response. The study recommended the formulation of clear policies and guidelines that could govern the use of ICT in disaster response, ensuring that data security, privacy protection, and the interoperability among different organisations and agencies. The study also recommended the development of partnerships between humanitarian organisations, the government agencies, and the private sector entities to jointly invest in and leverage ICT solutions for the disaster preparedness and the response by implementing a centralised platform that integrates all the relevant stakeholders and the data sources to ensure seamless communication and information sharing during the disaster response operations.

Key words: Supply Chain, Resilience, Disaster response, Humanitarian, Information Communication Technology (ICT)

Introduction

According to the African Institute for Development Policy, (2019) supply chain resilience is crucial for the humanitarian organisations to be able to effectively respond to disasters and provide aid to affected populations. In this regard Asghar & Alahakoon, (2020) report that Information and Communication Technology (ICT) plays a significant role in enhancing the resilience of supply chains by improving communication, coordination, and information management. Ahmad et al., (2021) mentioned that in the wake of disasters, humanitarian organisations all played a pivotal role in responding to the immediate needs of the affected populations.

According to Altay & Green, (2020), humanitarian organisations play a crucial role in responding to disasters and the emergencies worldwide, providing the most needed lifesaving aid and relief to populations affected by crises. Ben-Tal et al., (2021) observe that in the past, humanitarian responses to disasters have often been characterised by the challenges such as delays in the delivery of aid, the coordination issues among stakeholders, and the limited

transparency in supply chain operations. Ben-Tal et al., (2021) further state that in order to address these challenges and enhance the effectiveness of the disaster response efforts, it is essential to explore the innovative approaches that leverage information and communication technology in order to strengthen supply chain resilience in humanitarian operations.

Asghar & Alahakoon (2020) observe that historically, humanitarian organisations have been faced by significant obstacles in the delivering of aid during disasters due to a lack of coordination, limited visibility into supply chain operations, and the inadequate communication systems. Behl & Dutta, (2019) further state that responses to the disasters have often been reactive rather than proactive, with the organisations mainly struggling to anticipate and to address the evolving needs of the affected populations in a timely manner. Bharosa et al., (2020) further mention that the complexities of operating in high-risk environments, including the conflict zones or the areas with limited infrastructure, have further compounded the challenges faced by the humanitarian supply chains. In the context of this study, Bharosa et al., (2020) define the term “response" as referring to the coordinated efforts that are undertaken by humanitarian organisations to provide assistance and support to the populations affected by disasters. Bharadwaj et al., (2020) further mention that this includes the activities such as assessing needs, mobilising resources, procuring and the distributing of aid supplies, the management of the logistics operations, and the delivering of the essential services to alleviate the impact of disasters on the affected communities. Bhattacharya et al., (2020) mention that a well-coordinated and timely response is essential to saving lives, reducing suffering, and restoring stability in disaster-affected areas.

According to Chikodzi et al., (2019), information and communication technology has emerged as a key enabler for the enhancement of supply chain resilience in the humanitarian operations. Mensah and Merkuryev (2020) state that ICT tools and technologies offer the opportunities to improve communication, data sharing, the decision-making, and the coordination across the supply chain network. Sheffi, (2021) observe that real-time tracking systems, geographic information systems (GIS), data analytics, and the mobile applications can all provide valuable insights into the supply chain operations, monitor the movement of goods, optimise routes, and then facilitate the quick decision-making during emergencies.

Asghar & Alahakoon (2020) observe that natural disasters and humanitarian crises have become increasingly frequent and severe on a global scale, affecting millions of people and posing significant challenges to humanitarian response efforts. The United Nations Office for the Coordination of Humanitarian Affairs (OCHA) reports that in 2020 alone, over 500 natural disasters occurred worldwide, leading to extensive human suffering, displacement, and economic losses (Lengnick-Hall et al., 2021). Lengnick-Hall et al., (2021) further note that the need for efficient and the resilient supply chains in humanitarian operations has never been more critical to ensure the timely and effective delivery of aid to those in need.

According to International Rescue Committee, (2021), Hurricane Maria (2017) struck the Caribbean, causing the widespread destruction in countries like Puerto Rico and Dominica. International Rescue Committee, (2021) further observes that the slow and inadequate response revealed logistical challenges in delivering aid promptly to affected communities. Joshi et al., (2022) mention that an earthquake in Nepal (2015) resulted in thousands of casualties and the extensive damage to infrastructure. Bharosa et al., (2020) observe that the humanitarian response faced difficulties in coordinating relief efforts and ensuring the efficient distribution of aid to remote and inaccessible areas. World Food Programme, (2020) notes that COVID-19 Pandemic (Global, ongoing) exposed vulnerabilities in the supply chains for medical supplies

and essential goods, highlighting the critical need for resilient logistics systems and agile response mechanisms to address evolving crises.

In the Southern African region, Chikwanha et al., (2020) note that countries like Zimbabwe face unique geographical and socio-economic challenges that make them particularly vulnerable to natural disasters. Gwatidzo et al., (2019) further note that cyclones, droughts, floods, and other climate-related events frequently impact the region, exacerbating food insecurity, displacement, and socio-economic vulnerabilities. According to Environment Africa (2022), the Southern African Development Community (SADC) region has been working towards enhancing disaster risk reduction and response mechanisms to build resilience in the face of these recurrent challenges. OCHA, (2020) mention that countries like Bangladesh, India, and Pakistan face recurrent flooding, affecting millions of people and disrupting livelihoods. Mutsvaire et al., (2020) state that strengthening the supply chain resilience is crucial to ensuring timely and effective disaster response in the region. Prolonged drought conditions in countries like Somalia, Ethiopia, and Kenya have led to food insecurity and humanitarian crises. IFRC, (2022) mentions that the effective distribution of the relief supplies has been challenged by infrastructure limitations and resource constraints.

Bhattacharya et al., (2020) note that the scope of work for the humanitarian organisations typically encompasses the various activities such as the emergency food and the shelter provision, the medical assistance, water and sanitation services, the logistical support, and other essential aid interventions. According to Chidziva & Mbohwa, (2019) Zimbabwe has a history of being vulnerable to natural disasters, with Cyclone Idai in March 2019 serving as a stark reminder of the country's susceptibility to the catastrophic events. Chanza et al., (2020) mention the devastating impact of cyclone Idai, a powerful tropical cyclone, that unleashed its wrath on Zimbabwe, causing widespread devastation in the eastern provinces. Chanza et al., (2020) further state that the cyclone brought torrential rains, triggering severe flooding, mudslides, and destruction of infrastructure, homes, and farmlands.

In response to the crisis, Chikwanha et al., (2020) state that the Government of Zimbabwe, alongside fellow humanitarian organisations initiated emergency relief efforts in order to assist the affected populations. Chikwanha & Mughogho (2020) further mention that the Zimbabwean authorities set up the emergency shelters, distributed food aid, provided medical assistance, and conducted search and rescue operations in order to mitigate the impact of the disaster. Behl & Dutta, (2019) observe that despite all these efforts, significant challenges emerged, that further revealed gaps in the country's disaster response capabilities. According to the International Rescue Committee (2021), more than 270 lives were lost, and 250,000 people were affected by the cyclone, with thousands of them left homeless and in urgent need of assistance. Environment Africa, (2022) note that the flooding caused extensive damage to critical infrastructure, including roads, the bridges, and the water supply systems, further exacerbating the challenges faced by the affected communities.

Chanza et al., (2020) note that the response to Cyclone Idai highlighted several key gaps in the Zimbabwe's disaster management and the humanitarian response systems. Chanza et al., (2020) further note that coordination gaps among various stakeholders, the limited access to real-time data and information, the logistical bottlenecks in delivering aid, and the communication breakdowns impeded the effectiveness of the relief efforts. Chanza et al., (2020) observe that the lack of integrated ICT solutions to support supply chain resilience in humanitarian operations became evident during the crisis, hindering the timely and efficient delivery of aid to those in need.

According to Gwatidzo et al., (2019), Zimbabwe, with its diverse topography and climate patterns, has experienced a series of natural disasters that have had devastating consequences on its population and infrastructure. Chanza et al., (2020) further mention that in addition to the aforementioned Cyclone Idai, the country has faced recurrent droughts, floods, and disease outbreaks that have strained its disaster management and response capacities. However, according to Chanza et al., (2020) the Government of Zimbabwe, in collaboration with humanitarian organisations and development partners, has been working to improve disaster preparedness, response coordination, and resilience-building initiatives to safeguard communities from future disasters. Chanza et al., (2020) mention that the Cyclone Idai wreaked havoc in countries like Mozambique, Zimbabwe, and Malawi, causing extensive flooding and displacing thousands of people. Inadequate coordination and logistical hurdles hindered the delivery of aid to affected populations. Chikodzi et al., (2019) state that periodic droughts and recurrent food insecurity episodes have affected vulnerable populations in Zimbabwe, requiring sustained humanitarian interventions and resilient supply chains to ensure adequate aid delivery. Chidziva & Mbohwa (2019) further note that Zimbabwe has faced several cholera outbreaks due to poor water and sanitation infrastructure, emphasising the importance of efficient logistics and supply chain management in responding to health emergencies.

Dzviti et al., (2018) observe that the integration of ICT in humanitarian supply chains holds great potential for improving the resilience and effectiveness of disaster response efforts. Chanza et al., (2020) mention that during cyclone IDAI in Zimbabwe, it was all evident that there was limited integration of information and communication technology within the humanitarian operations in Zimbabwe. Beydon et al., (2022) observe that the key challenges that were noted include the lack of comprehensive risk assessment and preparedness strategies, underutilisation of ICT tools, fragmented coordination among stakeholders, logistical constraints, and vulnerabilities of marginalised populations. During cyclone IDAI in Zimbabwe, it was evident that humanitarian organisations had gaps that hindered the efficiency and effectiveness of disaster response efforts, leading to the delays, inefficiencies, and the suboptimal outcomes in delivering aid to affected populations. It is against this background that the study aimed to assess the significance of Information and Communication Technology in improving disaster response by humanitarian organisations in Zimbabwe.

Supply Chain Resilience

According to African Institute for Development Policy (2019), supply chain resilience is paramount for humanitarian organisations that are operating in Zimbabwe, given the country's challenging socio-economic landscape and the recurrent disruptions that affect supply chains. In a study conducted by Rungani & Ndhlovu, (2018), the importance of enhancing supply chain resilience in Zimbabwe was emphasised as a crucial aspect for the humanitarian organisations to navigate uncertainties and maintain the operational efficiency in the face of various challenges. Leat & Revoredo-Giha (2019) further note that the ability to anticipate, adapt to, and recover from the disruptions is essential for ensuring the continuity of operations and enabling the timely responses to supply chain challenges. Levinthal & Rerup, (2020) observe that the impact of supply chain disruptions on organisations in Zimbabwe cannot be understated. Factors such as inflation, inadequate infrastructure, and political instability pose significant threats to the smooth functioning of supply chains in the country.

To address these challenges, formulation of proactive measures is essential to bolster resilience. Linnenluecke (2019) mentions that strategies such as the inventory optimisation, which involves the management of inventory levels to meet demand while minimising the excess

stock, can be of help to humanitarian organisations in Zimbabwe to help them mitigate the impact of disruptions and maintain their operational continuity. According to Maghsoudi et al., (2021), flexible sourcing strategies are also key in enhancing supply chain resilience in Zimbabwe. Maghsoudi et al., (2021) further observe that diversifying sourcing locations and suppliers, humanitarian organisations can be in a position to reduce their dependency on a single source and mitigate risks associated with supply chain disruptions. Maghsoudi et al., (2021) further note that collaboration with key stakeholders, including suppliers, logistics partners, and governmental agencies, is another critical aspect highlighted in the study.

Maitlis & Christian (2020) state that fostering strong partnerships and communication channels, organisations can build resilience by facilitating the information sharing, coordinated responses, and resource pooling during times of crisis. Maitlis & Christian, (2020) further argue that implementing proactive strategies, building the collaborative networks, and leveraging ICT solutions, humanitarian organisations in Zimbabwe can be able to enhance their supply chain resilience and effectively navigate the complex challenges present in the country's humanitarian aid sector. Ahmad et al., (2021) argue that the ability to forecast potential disruptions, such as the natural disasters or conflicts, is crucial for humanitarian organisations. African Institute for Development Policy (2019) further reports that utilising early warning systems and predictive analytics, organisations can proactively identify risks and implement contingency plans to mitigate the impact of these disruptions. For example, the OCHA, (2021) uses predictive analytics to anticipate and prepare for the potential humanitarian emergencies, enhancing their ability to respond swiftly and effectively. According to a study by Chikwanha & Mughogho, (2020), supply chain resilience in humanitarian operations is paramount for responding effectively to crises and ensuring the timely delivery of aid to affected populations.

Information and Communication Technology (ICT)

According to Chanza et al., (2020), in Zimbabwe, ICT plays a pivotal role in revolutionising and optimising the supply chain operations by enhancing efficiency and effectiveness. A study that was conducted by Masiye et al., (2019) shed light on the significant impact of ICT tools, including the inventory management systems, the real-time tracking technologies, and the communication platforms, in streamlining the supply chain processes and improving decision-making within organisations operating in Zimbabwe. According to Chikwanha et al., (2020) the adoption of ICT solutions in the Zimbabwean humanitarian organisations has brought about notable improvements in the various aspects of supply chain management. Chidziva & Mbohwa (2019) argue that these technologies have been instrumental in the boosting transparency, enhancing visibility, and fostering collaboration across supply chain networks in the country. A study by Beydon et al., (2022) highlight that leveraging ICT tools effectively, the humanitarian organisations can be in a position to tackle logistical challenges, reduce lead times, and elevate the overall performance of their supply chains. Beydon et al., (2022) further argue that the study underscores the importance of investing in robust ICT infrastructure and cultivating the digital capabilities to drive innovation and the competitiveness in the Zimbabwean supply chain sector. Gwatidzo et al., (2019) identify that the integration of ICT tools in the supply chain operations of organisations in Zimbabwe has not only improved the operational processes but also it has positioned them for sustainable growth and competitiveness in the dynamic market environment.

Importance of ICT in humanitarian Disaster Response

Joshi et al., (2022) support that information and Communication Technology (ICT) plays a critical role in enhancing the effectiveness, efficiency, and resilience of humanitarian relief operations, particularly in optimising supply chain management processes. Asghar &

Alahakoon (2020) further outline that in disaster-prone areas and crisis situations, ensuring the timely and efficient delivery of aid supplies to affected populations is essential for addressing critical needs, minimising disruptions, and saving lives. According to Asghar & Alahakoon, (2020), a comprehensive ICT framework tailored to humanitarian relief operations, with a specific focus on improving supply chain resilience, can empower organisations to leverage technology solutions, enhance coordination, and strengthen logistics capabilities in delivering humanitarian assistance. Ben-Tal et al., (2021) further support the idea that integrating ICT tools, data-driven insights, and collaboration platforms into supply chain operations, organisations can mitigate risks, respond to emergencies effectively, and build adaptive systems that withstand disruptions and deliver aid more efficiently.

Makoni, et al., (2021) emphasised that implementing robust data management systems, real-time tracking platforms, and data visualisation tools enable organisations to monitor supply chain flows, track inventory levels, and analyse logistical data to optimise decision-making, forecasting, and resource allocation in emergency response scenarios. Behl & Dutta, (2019) mentioned that leveraging ICT solutions such as RFID technology, IoT sensors, and blockchain-enabled platforms enhance supply chain visibility, transparency, and traceability, allowing organisations to track the movement of goods, manage inventory, and ensure accountability in aid distribution processes. Bhattacharya, et al., (2020) emphasised that utilising collaborative networks, communication technologies, and information-sharing platforms facilitate real-time communication, coordination among stakeholders, and exchange of critical data to enhance situational awareness, streamline logistics, and promote seamless collaboration in supply chain operations. Bhattacharya, et al., (2020) also highlighted that iintegrating risk assessment tools, predictive analytics, and scenario planning capabilities enable organisations to identify vulnerabilities, assess risks, and develop contingency plans to enhance supply chain resilience, mitigate disruptions, and respond effectively to changing conditions in humanitarian operations.

Gwatidzo, et al., (2019) pinpoint that investing in workforce development, providing training programmes on ICT tools, supply chain management best practices, and emergency response protocols empower staff to acquire technical skills, adapt to technology changes, and enhance operational readiness in deploying technology solutions to improve supply chain resilience in humanitarian relief operations. Gwatidzo, et al., (2019) also emphasised that establishing performance metrics, monitoring key performance indicators (KPIs), and conducting regular evaluations of ICT enabled supply chain operations facilitate continuous improvement, identify areas for optimisation, and drive innovation in enhancing supply chain resilience, efficiency, and effectiveness in humanitarian relief efforts

Research Methodology

This section presented the methodology applied in this study. The study adopted a quantitative research strategy. The population for this study comprised of 160 individuals which were purposively selected from the humanitarian organisations which operated in Manicaland, Zimbabwe where Cyclone IDAI took place in 2019. These organisations included Caritas, Action Aid, World Vision, Plan International, CARE International, Department of Civil Protection, International Organisation for Migration and World Food Programme Humanitarian Relief Operations. In arriving at the sample size, the Yamane formula was used as illustrated below:

$$n = \frac{N}{(1 + Ne^2)}$$

Where N = population size, and e = significance level (0.05)

$$n = \frac{160}{1 + (160 \times 0.05^2)}$$

$$n = \underline{114}$$

In line with the sample size computations above, it can be deduced that the sample size for this study comprised of 114 employees of the selected humanitarian organisations operating in Manicaland province, Zimbabwe. This study used the structured questionnaires as research instruments. According to Bricki & Green (2019), questionnaires provide a structured format for collecting specific information, allow for standardised data collection across multiple organisations, and facilitate the quantification of responses for analysis.

Results and Discussion

The importance of ICT in humanitarian disaster response was covered in this section. Descriptive statistics: mean and standard deviation were employed to assess the importance of ICT in humanitarian disaster response.

Table1: Importance of ICT in humanitarian disaster response

	N	Mean	Std. Deviation
The lack of ICT tools in supply chains during disasters increases the likelihood of information gaps and communication breakdowns.	109	4.44	.886
Relying on manual processes rather than ICT technologies in supply chains leads to delays in decision-making during disaster situations.	109	4.30	1.023
The lack of ICT solutions during disasters compromises the safety and security of humanitarian personnel engaged in supply chain operations.	109	4.52	.632
ICT tools play a crucial role in improving the resilience and adaptability of supply chains in responding to dynamic disaster scenarios.	109	4.32	.932
ICT-enabled supply chains demonstrate better responsiveness and agility in adapting to changing disaster conditions compared to non-ICT reliant supply chains.	109	4.51	.741
Valid N (listwise)	109		

Table 1 indicated a Mean of 4.44 indicating that the respondents strongly agreed to the fact that lack of ICT tool presented information gaps and communication breakdowns during disasters. The table also show a mean score of 4.30 suggesting a significant agreement on the detrimental effects of manual processes on decision-making delays during disasters response. The results from the table 1 above also indicated a high mean score of 4.52 highlighting the consensus on the critical role of ICT solutions in ensuring the personnel safety during disaster-related supply chain operations within humanitarian organisation. A mean score of 4.32 in table 1 indicate that the respondents show a strong agreement on the vital role of ICT tools in enhancing supply chain resilience and adaptability during disaster scenarios. The results also show a high mean

score of 4.51 that signifies that the respondents show a strong consensus on the superiority of ICT enabled supply chains in responding to the changing disaster conditions.

These results aligned with the result of a study that was done by Gwatidzo et al., (2019) which showed that the lack of ICT tools can lead to communication failures and the information silos in the supply chains during crisis events. A study done by Beydon et al., (2022) supports this result, emphasising how ICT deficiencies in humanitarian organisations can lead to communication challenges and the disruptions in supply chain operations during crises. Similarly, the results of a study that was done by Asghar & Alahakoon, (2020) have highlighted how manual processes within humanitarian organisations can introduce inefficiencies and delays in decision-making, thereby affecting supply chain responsiveness during crises. Astudy that was done by Rungani & Ndhlovu, (2018) supports these results, highlighting how manual processes can also hinder the agility and the responsiveness in the supply chain decision-making under crisis conditions. These results concur with the results of a study that was done by Joshi et al., (2022) who have emphasised the importance of ICT solutions in the safeguarding of personnel engaging in humanitarian logistics activities during crisis events. Mensah & Merkuryev (2020) have also emphasised the crucial importance of ICT solutions in enhancing the visibility and the security for humanitarian personnel in the supply chain operations. A research study that was carried out by Tang (2021) also demonstrated how ICT tools can enhance supply chain capabilities to respond effectively to the disruptions and the uncertainties during crisis events. Research by Ben-Tal et al., (2021) has also shown that ICT adoption enhances supply chain responsiveness for the better adaptation to changing disaster conditions, ensuring supply chain resilience and performance supporting the results of this study. Also, a study that was done by Beydon et al., (2022) also have shown that ICT-enabled supply chains also exhibit enhanced responsiveness and agility, enabling effective the adaptation to evolving crisis scenarios within humanitarian organisations.

Conclusion and Recommendations

The study concluded that lack of ICT tools in humanitarian organisation increases the likelihood of information gaps and communication breakdowns during disasters. Relying on manual processes rather than ICT technologies in supply chains leads to delays in decision-making during disaster situations. The study also concluded that lack of ICT solutions during disasters compromises the safety and security of humanitarian personnel engaged in supply chain operations. The study further revealed that ICT tools play a crucial role in improving the resilience and adaptability of supply chains in responding to dynamic disaster scenarios. The study recommends the formulation of clear policies and guidelines that can govern the use of ICT in the disaster response, ensuring that data security, privacy protection, and the interoperability among different organisations and agencies. The study also recommends the development of partnerships between humanitarian organisations, the government agencies, and the private sector entities to jointly invest in and leverage ICT solutions for the disaster preparedness and the response by implementing a centralised platform that integrates all the relevant stakeholders and the data sources to ensure seamless communication and information sharing during the disaster response operations.

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