

RESEARCH

Open Access



Interagency collaboration and agile humanitarian crises response among humanitarian organizations in Uganda

Peter Dithan Ntale^{1*}, Jude Ssempebwa², Vivian Nalubega^{1*}, Robert Mugabe^{1*}, Florance Gumoshabe^{3*}, Justine Namaganda^{2,4} and Vincent Balikudembe¹

[†]Vivian Nalubega, Robert Mugabe, Florance Gumoshabe, Justine Namaganda and Vincent Balikudembe are Co-Authors.

*Correspondence:
Peter Dithan Ntale
pntale@mubs.ac.ug
Vivian Nalubega
vnalubega@mubs.ac.ug
Robert Mugabe
rmugabe@mubs.ac.ug
Florance Gumoshabe
fgumoshabe@mubs.ac.ug

¹Department of Business Administration, Faculty of Business Administration, Makerere University Business School, Plot 21A Port Bell Road, Nakawa, P.O Box 1337, Kampala, Uganda

²East African School of Higher Education Studies & Development (EASHESD), College of Education & External Studies (CEES), Makerere University, Kampala, Uganda

³Department of Communication, Faculty of Business Administration, Makerere University Business School, Plot 21A Port Bell Road, Nakawa, P.O Box 1337, Kampala, Uganda

⁴East African School of Higher Education Studies and Development, College of Education and External Studies, Makerere University, P.O Box 7062, Kampala, Uganda

Abstract

The escalating frequency and complexity of both natural and anthropogenic disasters have exposed serious structural and coordination weaknesses within Uganda's humanitarian systems. As these shocks intensify, long-standing structural weaknesses have become more visible, particularly the persistent fragmentation of institutional arrangements. This fragmentation undermines effective information sharing, coordination, and timely resource mobilization, thereby constraining the development of the preparedness and operational agility required for coherent and effective humanitarian action. This study, therefore, investigates interagency collaboration as a strategic mechanism to strengthen disaster preparedness, risk management, and agile humanitarian response in Uganda. Using a cross-sectional survey design, data were collected from 142 respondents across 60 purposively selected organizations through structured questionnaires, key informant interviews, and document reviews. Employing regression analysis, the findings indicate that interagency collaboration, disaster preparedness, and risk management collectively explain 42.4% of the variation in humanitarian agility, demonstrating their critical role in enhancing organizational responsiveness. Further, mediation analysis reveals that disaster preparedness partially mediates the relationship between interagency collaboration and agile response within the framework. Complementary thematic and documentary analyses corroborate these results, highlighting that collaborative approaches enhance readiness, optimize resource allocation, reduce inefficiencies, and foster timely interventions in crisis contexts, while reducing the significant role of often reactive, fragmented, and poorly operationalized risk management interventions in humanitarian contexts. Nevertheless, the findings acknowledge the influence of additional contextual factors beyond the scope of the study that shape humanitarian agility. The study concludes that redesigning organizational structures to institutionalize interagency synergy is vital for strengthening disaster preparedness, managing complex risks, and enabling coordinated, adaptive, and effective responses to humanitarian crises.

Keywords Agile response, Interagency, Collaboration, Disaster preparedness, Uganda



© The Author(s) 2026. **Open Access** This article is licensed under a Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License, which permits any non-commercial use, sharing, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if you modified the licensed material. You do not have permission under this licence to share adapted material derived from this article or parts of it. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by-nc-nd/4.0/>.

1 Background

In recent decades, Uganda has experienced a succession of acute humanitarian crises, both natural and anthropogenic. These include: severe storms, landslides, floods, fires, land disputes, epidemics, droughts, and famine. Historical data show that at least 20 major floods, 40 epidemics, 9 droughts, and 15 landslides have hit the country, collectively accounting for more than 350,000 lives lost and an estimated economic loss of approximately USD 80 million since 1900 [39]. Over the past decade alone (2014–2024), the intensity, frequency, and severity of these events have increased markedly, affecting more than 4.4 million individuals and disrupting livelihoods across multiple regions [72]. More recently, between January 2023 and October 2024, Uganda experienced a series of overlapping disasters, including hailstorms, landslides, fires, and market infernos, which affected over 50,000 people, displaced 7,908 families, and resulted in nearly 98,000 deaths (Uganda Multi-Hazards Infographics, 97). Consequently, these events exacerbated food insecurity and poverty for more than 1.2 million people, particularly in Central, Southwestern, and Northern Uganda [40], 20. Figure 1 shows the most disaster-prone areas in Uganda.

The trends highlight the increasing unpredictability of Uganda's disaster landscape; a pattern closely linked to climate change and environmental degradation. However, beyond the ecological dynamics, such crises expose the persistent institutional and operational gaps in national disaster management systems. Despite clear evidence of need, disaster responses in Uganda remain delayed, uncoordinated, and fragmented due to structural and systemic issues, including weak collaborative engagements, weak early

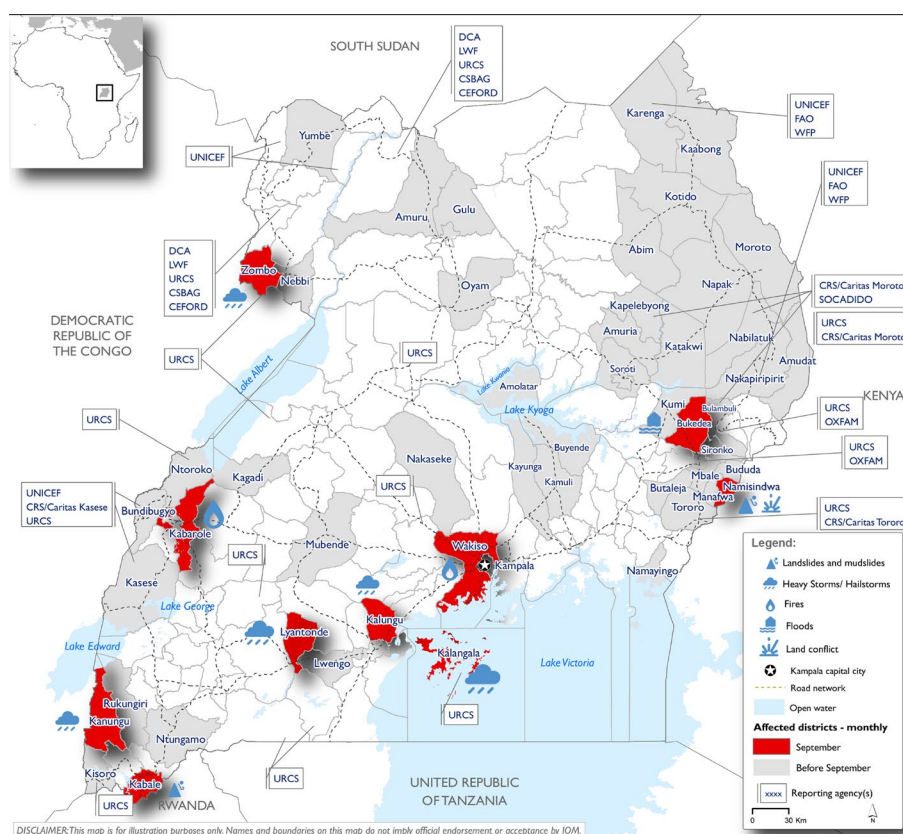


Fig. 1 A map of Uganda showing the disaster-prone areas

warning mechanisms, limited adoption of technologies such as GIS, AI, UAVs, and satellite imagery, and a lack of coordination among key state and non-state actors. To this end, the World Disaster Report (2020) estimates that up to 50% of disaster-related casualties could be mitigated through more agile response mechanisms, underscoring that humanitarian challenges in Uganda are not only environmental but also largely caused by structural and systemic organizational gaps. In countries where these structural and systemic parameters have been well aligned, significant results have been achieved in disaster response, such as California's wildfire response in 2019 [80].

Effective response in contemporary human settings requires multiple agencies to collaborate, share information, align decisions, and pool resources in real time. This recognition has led scholars to emphasize interagency collaboration as a strategic mechanism for strengthening disaster preparedness, risk management, and operational agility. Drawing on Gray's [35] interagency collaboration theory, collaboration enables stakeholders to leverage complementary capabilities and develop collective responses to complex crises. Empirical studies reinforce the idea that no single agency possesses the capabilities to manage humanitarian operations independently, making collaborative structures indispensable in disaster-prone contexts [23, 45].

Despite Uganda's extensive exposure to high-impact disasters, the degree to which interagency collaboration is institutionalized within its disaster management architecture remains insufficiently understood. This gap is significant because the country's humanitarian ecosystem comprises multiple stakeholders, including the government, private sector, civil society, local governments, and communities, whose coordination directly influences the speed and effectiveness of disaster response.

Thus, this study examines how interagency collaboration influences organizational preparedness and risk management and, in turn, supports agile humanitarian responses among humanitarian organizations in Uganda. By shifting analytical attention from hazards themselves to the institutional arrangements that shape collective action, the study contributes to ongoing debates on how collaborative mechanisms can generate agile humanitarian responses in disaster-prone contexts.

1.1 Statement of the problem

Despite efforts by the Office of the Prime Minister and affiliated agencies to enhance disaster readiness through hazard mapping, district-level risk assessments, and coordination frameworks [4], Uganda continues to experience delayed humanitarian responses. These delays have led to avoidable loss of life, prolonged suffering, and economic disruption in affected communities. A key contributing factor is the fragmented, individualistic approach adopted by many humanitarian actors, which undermines resource mobilization, effective communication and coordination, and resource sharing [99]. This disjointedness hampers organizational agility and weakens preparedness and risk management capacities. While literature acknowledges the importance of interagency collaboration in disaster contexts, there is a lack of empirical evidence linking such collaboration to improved preparedness and response in Uganda. To address this gap, the present study examines how interagency collaboration can enhance disaster preparedness, risk governance, and response agility, drawing on Gray's [35] theory of collaboration to generate both theoretical and practical insights for crisis management.

2 Related literature

2.1 Theoretical framework

The complex and multifaceted nature of disaster response necessitates coordinated, interagency collaboration rather than isolated, organization-specific efforts, which often fall short in managing crises effectively [81]. Literature increasingly emphasizes that collaboration among diverse actors with complementary mandates enhances operational efficiency, reduces duplication, and improves the timeliness and impact of humanitarian interventions [92]. This coordination strengthens preparedness and risk management by facilitating joint planning, resource sharing, and adaptive learning. Foundational elements such as hazard knowledge, leadership structures, preparedness education, and protective infrastructure are most effective when embedded within collaborative frameworks [52, 58, 70, 85]. Grounded in Gray's [35] interagency collaboration theory, successful coordination hinges on conducive organizational structures, strong social capital, and strategic agency alignment. Thus, interagency collaboration is not merely technical but a relational and organizational behavior shaped by internal capabilities and external dynamics, a perspective this study adopts to explore the enablers and constraints of effective disaster response.

2.2 Interagency collaboration theory [35]

Interagency Collaboration Theory, as articulated by Gray [35], provides a comprehensive lens for understanding how and why organizations choose to collaborate, particularly in complex and dynamic environments such as humanitarian crises. At its core, the theory posits that collaboration is a structured process through which organizations engage with one another, often across divergent histories, cultures, and institutional mandates, by developing shared rules, norms, and joint decision-making mechanisms. Crucially, organizations are more likely to collaborate successfully when their internal structures, social capital, and agency are conducive to interdependence and mutual action.

First, interagency collaboration is built by the way organizations are structured. This encompasses governance arrangements, administrative hierarchy, and the degree of centralization and formalization. The theory also emphasizes that organizations with decentralized and less formal structures are more amenable to collaboration, as they tend to promote inclusivity in decision-making, reduce power distance, and allow for flexible job descriptions and rule enforcement. In humanitarian contexts, these attributes are especially valuable, as they facilitate rapid decision-making, foster relational engagement, and reduce bureaucratic bottlenecks, which are essential in time-sensitive disaster scenarios [98]. As mentioned by previous scholars, it is evident that such decentralized structures enable the rapid transmission of high-quality information across stakeholders. They also promote interdisciplinary dialogue and stakeholder engagement, which are crucial for building a shared understanding of disaster risks and for coordinating agile response efforts [22]. Therefore, organizational structures that prioritize horizontal coordination and relational capacity are more likely to be resilient and responsive in humanitarian crises as they create synergistic flexibility upon which humanitarian support rests [77].

Secondly, the theory of collaboration by Gray [35] emphasizes the creation of social capital and the development of relational dynamics. This defines the character of internal and external social relationships that foster cooperation and collective action. Social

capital is composed of three critical dimensions: mutuality, trust, and reciprocity [94]. Mutuality refers to positive, interactive relationships and consensus-building among collaborators. Trust reduces transaction costs and accelerates decision-making, while reciprocity ensures that each party perceives shared value and equitable benefit. These relational dynamics are vital in humanitarian settings, where successful disaster preparedness and response depend on effective collaboration across institutional boundaries. As Dahal and Adhikari [27] and [14] argue, social capital not only strengthens collaborative capacity but also serves as a resource during disaster recovery. By drawing upon established trust networks and reciprocal ties, organizations can more effectively mobilize resources, coordinate interventions, and adapt to rapidly evolving humanitarian needs.

Finally, the theory emphasizes the agency and the willingness to collaborate. Here, Grey (1989) referred to an organization's capacity and willingness to act independently or in pursuit of collaborative goals. While institutional autonomy is often prioritized for organizational identity and performance, Tschirhart et al., [89] contend that the pressing nature of humanitarian challenges necessitates a more substantial commitment to collaboration, even at the expense of institutional self-interest. Collaborative agency involves a conscious choice to engage in collective action for the public good, recognizing that no single organization can effectively address disaster risks in isolation. Organizational designs should therefore not only permit but encourage collaborative engagement. This includes structures that support shared decision-making, minimize hierarchical barriers, and relax rigid rules that inhibit flexibility [16, 24, 65]. Such configurations enable organizations to exchange critical information, reduce duplication, and foster mutual responsibility which are essential for effective humanitarian coordination.

In all, Gray's [35] interagency collaboration theory conceptualizes interagency collaboration as a relational and structural mechanism that shapes organizational preparedness and risk management capacities, ultimately enabling agile humanitarian response. Gray's framework, therefore, provides an analytical lens that links organizational structures, social capital, and agency to the core variables of this study and the hypothesized relationships.

Although Gray's [35] framework on interorganizational collaboration remains foundational, contemporary scholarship has extended its application to public-sector networks, crisis governance, and interagency coordination. For example, [53] extended Gray's collaboration framework to employability of graduate students from a developing country context, while Ansell & Gash (3), Provan & Kenis (95), Kapucu (89), and Comfort (81) extended the theory in public sector governance and humanitarian systems, respectively. Recent studies highlight that collaborative problem-solving, resource pooling, and joint decision-making—central to Gray's conceptualization—remain critical for navigating complex challenges, including emergencies and humanitarian crises."

2.3 Synthesizing the theoretical constructs and the theoretical proposition

Bringing these three dimensions together—structure, social capital, and agency—interagency collaboration emerges as a multifaceted process grounded in trust, relational reciprocity, and organizational adaptability. When these sub-constructs are aligned, organizations are better equipped to decentralize authority, streamline rules, and engage in collaborative problem-solving. This synergy minimizes redundancy, breaks down

complex tasks into manageable components, and enhances responsiveness in disaster scenarios [53, 68]. However, it is important to acknowledge the inherent complexities. As Butcher and Gilchrist [20] note, designing sustainable collaborative systems remains a challenge due to the often elusive and evolving nature of interagency relationships. Even when motivated by humanitarian imperatives, organizations may struggle to build trust, negotiate shared goals, and manage divergent expectations [37]. Without careful attention to these dynamics, collaboration can falter, resulting in fragmented responses and diminished disaster preparedness. In conclusion, the theoretical literature emphasizes the crucial role of interagency collaboration in enhancing disaster preparedness, risk management, and organizational resilience. Effective collaboration, enabled by supportive structures, robust social capital, and collaborative agency, positions organizations to respond more cohesively and quickly to humanitarian emergencies, as evidenced by global governance scholarship, which increasingly treats interagency collaboration as a critical mechanism for managing complex humanitarian and disaster risks that transcend national jurisdictions. Rather than relying solely on state-centric command structures, contemporary disaster governance operates through polycentric networks involving international organizations, national authorities, NGOs, and civil society actors (Barnett & Duvall, 79; Avant et al., 78). Within this architecture, collaboration enables shared decision-making, information exchange, and resource coordination, and is institutionalized through mechanisms such as the Inter-Agency Standing Committee and the cluster coordination system (Donini, 85; Bennett & Foley, 2016). These arrangements reflect a broader shift toward collective action and interoperability across the humanitarian system. Furthermore, disaster preparedness serves as a bridge among humanitarian response, development planning, and resilience-building agendas, making it a focal governance framework within the global humanitarian system architecture. This has been clearly defined in the Sendai Framework, which emphasizes collaborative and interactive initiatives, anticipatory planning, capacity-building, and early warning systems as essential components of disaster preparedness (UNDRR, 2015). Although scholars highlight its inherently interorganizational character (Boin & Lodge, 80; Tierney, 99), available empirical evidence shows that its implementation remains uneven, particularly in lower-income contexts where fragmented institutions and resource constraints limit alignment with global norms (Baharmand et al., 76). Taken together, global, regional, and context-specific governance literature underscores interagency collaboration and preparedness as mutually reinforcing mechanisms for improving coordinated disaster management.

H1 Interagency collaboration has a positive influence on disaster preparedness and risk management, thereby enhancing the agility of humanitarian organizations.

2.4 Disaster preparedness and agile response

Effective disaster planning enables a swift response to adverse situations and mitigates their impact. This includes creating a detailed contingency plan for immediate implementation when necessary [69]. Contingency planning focuses on proactive planning, emphasizing the elimination of risks rather than simply figuring out how to overcome them. It is more cost-effective and efficient to plan to overcome potential risks rather than dealing with the increased costs and extended duration required to address them.”

[95]. Various organizations have adopted a National Policy on Disaster Management; to implement this policy, organizations require establishing the right frameworks, including hazard knowledge, management direction and coordination, supportive resources, and life safety protection, to develop a disaster preparedness policy. The policies establish guidelines and infrastructure for managing organizational disasters [5]. The policy proposes a structural framework for institutions to coordinate disaster responses consistently and coherently across the country [50]. The framework aims to ensure appropriate disaster preparedness, making populations less helpless and vulnerable, and better able to resist and mitigate the effects of perils and various emergencies, as well as adapt to agile response deviations [32].

Unfortunately, many disasters have revealed poor disaster preparedness and management in some countries. Disaster preparedness and agile response management are important not only for the public sector but also for the private sector. This is because disasters affect both sectors, so both need to be prepared. In recent years, the private sector has played an increasingly significant role in disaster management. However, their level of preparedness for disasters is low, which is concerning given the nature of disasters. It has been proven that for every dollar spent in preparing for a disaster, seven dollars are saved during the response [19]; an important lesson learned from recent disasters is to be prepared. Practitioners and scholars [10] agree that preparation is a significant part of a relief effort. Additionally, humanitarians are starting to take the lessons from past disasters to heart and understand that their efforts must be concentrated during disasters and in the interim. They are considering how they can perform better by being more organized [7]. Being well-prepared is crucial for providing an effective response. One of the biggest challenges in the humanitarian sector is recognizing and understanding that logistics is essential to any relief operation. This recognition is necessary before designing the functions and improving preparedness through effective disaster management [83]. Numerous studies in the literature confirm that effective response to disasters requires thorough preparation. However, according to Bronfman et al., [19], the specific requirements for preparation by humanitarian organizations remain unclear. Organizational designers and strategists suggest that disaster preparation relies on collaborative activities among various relief agencies. They argue that organizations cannot achieve the synergy necessary for an agile response to humanitarian crises without such collaboration. Regardless of how organizations achieve disaster preparedness, it remains a critical requirement for effectively responding to disasters and saving lives and property. We therefore hypothesize;

Additionally, as a pillar of disaster governance frameworks, disaster preparedness is achieved through anticipatory, resilience-oriented, collaborative initiatives rather than reactive, isolated responses. These pillars are embedded in the Sendai Framework, which emphasizes collaborative engagement, social interaction, preparedness, risk awareness, early warning systems, and contingency planning as critical components of disaster risk reduction (UNDRR, 2015). Preparedness is widely conceptualized as a multilevel institutional process involving scenario planning, resource pre-positioning, simulation exercises, and knowledge transfer mechanisms that improve organizational readiness before hazards materialize (Paton & Johnston, 2017; Tierney, 2019). Scholars also argue that preparedness is relational and interorganizational, requiring coordination across humanitarian agencies, local governments, civil society, and international organizations

to mitigate information asymmetries and operational bottlenecks during crises (Boin & Lodge, 17). In low-income development contexts such as Uganda, preparedness capacity is often constrained by fragmented governance systems, infrastructure gaps, and limited financing, underscoring the importance of capacity-building and institutional alignment to enhance resilience (Baharmand, Comes & Lauras, 76).

Agile response has emerged as a complementary concept within humanitarian and development studies, referring to an organization's ability to rapidly adapt, coordinate, and adjust operational decisions under conditions of complexity and uncertainty. Drawing from organizational theory and complex adaptive systems (CAS), scholars emphasize the role of decentralized decision-making, improvisation, and learning mechanisms in enabling agility during humanitarian operations (Uhl-Bien & Arena, 100; Comfort et al., 82). Agile humanitarian response also depends on cross-organizational collaboration, shared situational awareness, and flexible resource mobilization to reduce latency between hazard onset and relief delivery (Walker & Maxwell, 2009; Baharmand et al., 77). Within global governance frameworks, agility is increasingly linked to the humanitarian–development–peace nexus, where coordinated and adaptive responses are necessary to manage cascading risks and protracted crises (Bennett & Foley, 2016). Yet scholars observe persistent operational challenges—such as bureaucratic rigidity, mandate fragmentation, and hierarchical command structures—that inhibit agility in many humanitarian systems, particularly in the Global South, where institutional reforms and investments in interoperability remain uneven (Donini, 85; Barbelet, 78).

H^2 Disaster preparedness positively influences the agility of humanitarian response during crises.

2.5 Risk management and agile response

Risk management within humanitarian organizations encompasses a systematic process of identifying, assessing, controlling, and monitoring potential risks that may impede operational effectiveness. As Tavares et al. (96) contend, the ability of these organizations to remain resilient in the face of both internal vulnerabilities and external shocks is largely contingent upon the robustness of their risk management frameworks that potentially adhere to this systematic process. This process enables stakeholders to proactively engage in the continuous evaluation of emerging threats and implement appropriate control measures, which humanitarian actors can significantly use to enhance their adaptive capacity. Consequently, this contributes to the minimization of operational disruptions and the mitigation of losses that may otherwise jeopardize their long-term viability and mission fulfillment (Majka, 92). Therefore, the creative endeavors essential for gaining a competitive edge in the humanitarian market often involve high-risk processes and systemic impediments that necessitate decisive decisions and effective practices. Thus, it becomes increasingly critical to examine how risk management can be operationalized within agile response frameworks. Agile methodologies, characterized by adaptability, rapid iteration, and decentralized decision-making, offer a promising avenue for enhancing the responsiveness of humanitarian organizations to dynamic and uncertain environments. However, integrating risk management into such fluid and iterative processes requires a nuanced understanding of both formal and informal mechanisms for identifying and mitigating threats. As humanitarian ventures often operate in

volatile contexts, this research aims to explore how agile approaches can be integrated with risk management strategies to enhance resilience, ensure continuity, and foster innovation in uncertain environments.

Moreover, disaster risk management must be integrated into individual development projects and mainstreamed as a cross-cutting issue, considering the potential impacts of extreme natural and human-induced events streamered as a cross-cutting issue [64]. The catastrophic force of these occurrences and the disasters they cause will repeatedly take lives, reverse economic growth and development progress, and worsen poverty unless risks are minimized and managed continuously [88].

Thus, for efficient disaster prevention and quicker response times, it is essential to comprehend how hazards, exposure, and vulnerability interact. To put it another way, the goal of humanitarian action is to make people less susceptible to danger, enabling them to withstand shocks and stresses more effectively. People or households can develop strategies to lessen their vulnerability by strengthening or diversifying their sources of income, which leads to faster response times. It is imperative to search for potential solutions to address residual risks continuously, and public and private development and investment projects in developing nations should, to the extent feasible, avoid creating new risks [2]. Research unequivocally demonstrates that effective risk management leads to quicker reaction times, as previously mentioned; consequently, more investigation is necessary to determine the scope and devise tactics. This call appears to have gone unheeded by many researchers, though, which may be explained by the ongoing delays that occur during a disaster. Therefore, it is crucial that this study examines the relationship between risk management and agility in humanitarian crises.

H^3 Effective risk management positively influences the agility of response efforts in humanitarian crises.

2.6 Conceptual framework

See the conceptual model in Fig. 2.

3 Methodology

3.1 Research design

This study employed a cross-sectional survey design combining both quantitative and qualitative methods over a specified period. Quantitative studies are more scientific, focused, and relatable, while qualitative studies are more grounded in reality and bring out participants' perceptions of a given phenomenon [31]. Given the limited funds for conducting longitudinal studies, this research design was found to be cost-effective and easier to implement, yet it is also robust enough to cover the multiple variables investigated in our study [73].

3.2 Quantitative data collection

Quantitative data were collected from respondents through a self-administered questionnaire. This involves questioning, guided by identified themes in a consistent and systematic manner, interposed with probes to elicit more elaborate responses [1]. The questionnaires were sent to the respondents, who filled them out without assistance from the research assistants. This is because the respondents had some level of

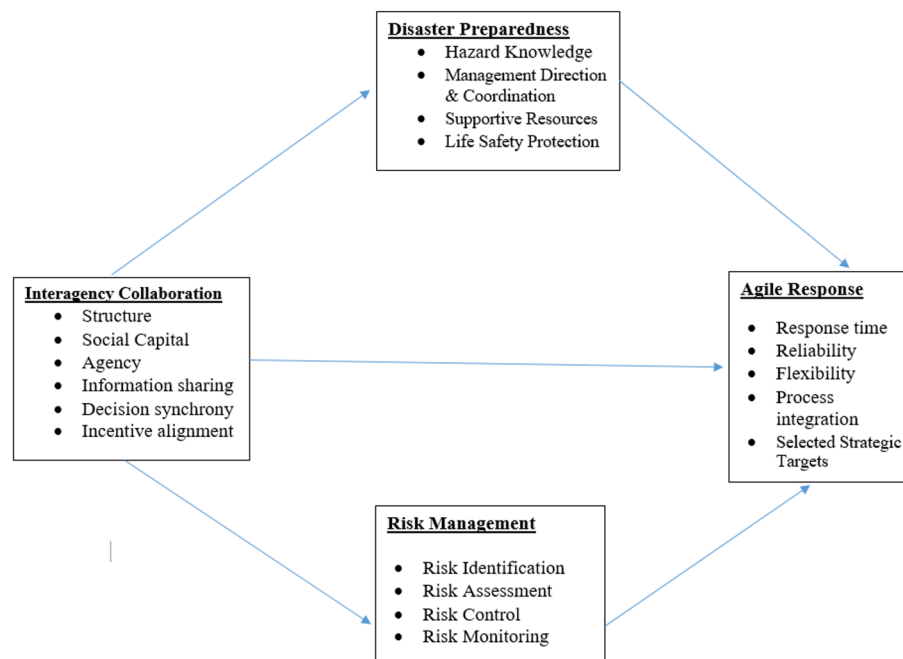


Fig. 2 A map of Uganda showing the disaster-prone areas. Source: Developed from literature (Grey, 1989; Simatupang & Sridharan, [78]; [75])

education that allowed them to understand the questionnaire. The questionnaire mainly comprised closed-ended questions aligned with the study objectives. Respondents indicated their level of agreement or disagreement with the questionnaire statements.

3.3 Qualitative data collection

We conducted a qualitative data collection using interview guides. This happened immediately after quantitative data collection and lasted 7 days from the start date. Here, we contacted several research participants to discuss questions about the study variables. These questions included “How would you describe the nature of collaboration between your organization and other humanitarian agencies during disaster preparedness and response activities?” “From your experience, what factors enable/constrain effective interagency collaboration?” (see Table 1 for more qualitative questions). To select respondents for these questions, we used purposive sampling to identify qualitative participants. This technique was instrumental in gaining access to experts whose roles positioned them at critical nodes of decision-making and coordination, thereby enabling the study to explore the mechanisms, constraints, and enablers underpinning agile humanitarian responses. Our interest was the employees occupying strategic and operational roles within the humanitarian organization. These individuals were considered knowledgeable informants due to their direct involvement in disaster preparedness, risk management, coordination, and day-to-day operational decision-making. Positions of interest included disaster or emergency coordinators, program and project managers, logistics personnel, operations officers, and individuals embedded within interagency liaison units. Recruiting participants from these functional domains ensured that interviews would yield rich, experience-based insights into how interagency collaboration is enacted and how organizational agility is operationalized in disaster response settings.

Table 1 Qualitative interview questions

Question No.	Interview question
1	How would you describe the nature of collaboration between your organization and other humanitarian or government agencies during disaster preparedness and response activities?
2	From your experience, what factors enable or constrain effective interagency collaboration in disaster response settings?
3	Can you explain how information sharing occurs across agencies during emergency operations, and how this affects decision-making?
4	In what ways does your organization adapt its operations and response protocols when confronted with rapidly evolving disaster scenarios?
5	What kinds of coordination mechanisms or structures have proved useful in improving preparedness, risk management, or response agility?
6	Could you share how social capital helps interagency collaboration and where it lacks, what happens to agencies in disaster response?
7	How do leadership, communication, and organizational culture influence collaboration and agility within disaster response operations?
8	What lessons has your organization learned from past disaster events that have shaped current preparedness and coordination practices?
9	In your view, what improvements could be made at the interagency or organizational level to enhance agile response capabilities in future humanitarian emergencies?

This process yielded 15 qualified participants purposively selected from employees of 60 humanitarian organizations. The purpose of these qualitative interviews was to complement the quantitative survey findings by addressing interpretive nuances that are not easily captured through structured questionnaires, particularly those related to interagency coordination practices, contextual contingencies, and learned adaptive behaviors. To obtain the most qualified sample, we purposively selected 15 employees from different organizations, following [36] theoretical framework, which suggests that 12–24 interviews are generally sufficient to achieve thematic saturation in qualitative research. Following a comprehensive literature review, we generated nine (09) open-ended and exploratory questions related to the study variables. The purpose of these questions was to explore the participants’ experiences, perceptions, and interpretations of how disaster preparedness, risk management, coordination mechanisms, and adaptive decision processes unfold in practice. Using the interview guide, we asked questions while recording each interview, which lasted about 40–50 min.

3.4 Documentary review

We also carried out a documentary analysis to examine the extent to which the agility of humanitarian organizations is a function of interagency collaboration. We reviewed documents such as the National Disaster Manager Policy (2019), the Emergence Relief and Rehabilitation Act (1990), the NGO Act 2017, NGO Guidelines 2018, Disaster Response Operational Manuals, the Code of Ethics, Human Resource and Finance manuals, the mission and objectives of the organizations, the strategic plan manuals, the memorandum and articles of association, particularly for private organizations. These documents constituted a third data source within the triangulation framework and contributed to both validation and contextualization of the empirical findings. Policy documents, strategic plans, operational guidelines, and institutional reports were examined to corroborate and contextualize patterns emerging from the quantitative surveys and qualitative interviews. Documentary reviews were used to assess the alignment between formally articulated coordination frameworks and the collaboration practices reported by respondents, thereby facilitating convergence checking and explanatory interpretation. Where

inconsistencies were observed, a documentary review helped illuminate implementation and structural gaps, strengthening the interpretive rigor of the triangulation process [48].

3.5 Qualitative data analyses

Qualitative data were analyzed using thematic analysis. Interview transcripts were first read several times to achieve familiarity, after which initial codes were generated to capture recurring patterns related to interagency collaboration, disaster preparedness, risk management, and agile humanitarian response. Related codes were then grouped into bigger themes, which were reviewed and refined to ensure internal consistency with the study variables. The final themes were interpreted in relation to the quantitative findings to support triangulation and provide contextual depth. Furthermore, we conducted a qualitative content analysis of documentary data. Here, systematic reviews were done to identify provisions related to the study variables. Extracted content was coded thematically and compared with quantitative and interview findings to assess convergence, contextualize results, and explain observed divergencies. Data saturation was assessed during analysis, with no new themes emerging in the final interviews.

3.6 Inclusion and exclusion criteria

Individuals were eligible for inclusion if they had direct experience in disaster preparedness, risk management, and humanitarian response, particularly in contexts that required cross-organizational coordination or rapid decision-making. Further consideration was given to the number of years spent working with humanitarian organizations at a strategic or operational level for at least 1 year. We also considered including participants who could articulate their experiences and provide contextual insights into interagency collaboration and related variables in a humanitarian setting. Conversely, individuals were excluded if they lacked operational or strategic responsibilities in disaster preparedness or humanitarian response, were not directly involved in humanitarian responses, or had inadequate knowledge of interagency collaboration.

3.7 Study population

The study population was drawn from all the non-governmental organizations (NGOs) operating in Uganda. According to the National Bureau for NGOs (UNBNGOs), Uganda has 5,093 registered NGOs in Uganda with a variety of mandates ranging from education, health, welfare, social justice, humanitarian justice, gender equality, democracy, youth empowerment, and many other fields. The Uganda National Bureau for NGOs is a statutory body under the Office of the Prime Minister (OPM) whose role is to register, monitor, and evaluate the performance of NGOs in the country to comply with the national agenda of social and economic transformation [67]. Out of the 5,093 registered NGOs, only 80 organizations are categorized by the Uganda National Disaster Response Taskforce as humanitarian organizations, providing relief services such as food, water, shelter, medical treatment, evacuations, and resettlements to disaster-prone communities across the country [43].

3.8 Sample size

Purposive sampling was used to select 60 organizations directly engaged in humanitarian operations. These organizations were deliberately chosen to ensure inclusion of entities capable of providing rich, relevant insights into interagency collaboration, disaster preparedness, risk management, and agile humanitarianism. This sampling strategy was essential for capturing data that would not have been accessible through a more generalized selection of organizations not actively involved in such activities. Given the importance of this research, all 60 organizations responded positively to our request and provided direct access to their staff for further engagement.

Purposive sampling was also applied at the participant level, with individuals occupying key operational roles—such as disaster coordinators, project or program managers, logistics officers, and operations managers—intentionally selected. These people were chosen because they are directly involved in the planning, coordination, and execution of humanitarian disaster response activities, and therefore possess contextual knowledge and experiential insights not readily available to administrative or peripheral members.

Data were obtained from personnel within the 60 purposively selected organizations. We purposively selected three employees from each organization, giving us 180 respondents. However, only 142 respondents completed our questionnaires, which were subsequently coded, entered into SPSS, and prepared for further statistical analysis. The data collected from the respondents were on key variables, including interagency collaboration, disaster preparedness, risk management, and agile humanitarian response. Besides the demographic characteristics, we obtained data that helped us to carry out correlation and regression analyses. However, 38 participants did not respond to our questionnaires, resulting in a non-unit response at the respondent level. This was largely due to the remoteness of some areas, making it difficult to reach respondents, low literacy levels, and survey fatigue. Although efforts were made to reduce this non-unit response, achieving a 100% response rate was difficult, given the challenges of reaching employees scattered across the country. Nonetheless, the number of non-respondents was relatively small and unlikely to compromise the representativeness of the achieved sample [57].

3.9 Instruments

A paper-based self-administered questionnaire was used to collect quantitative data. These questionnaires, which we distributed to the respondents, were completed independently and subsequently collected by six (06) trained research assistants three weeks (03) after receipt. They were predominantly closed-ended, which helped participants complete them without assistance from research assistants. The closed-ended question allowed standardized responses, minimized respondent burden, increased completion rates, made coding and analysis easier, ensured consistent interpretation, and allowed completion without assistance Semyonov-Tal, [71]. This tool enhanced privacy by allowing participants to complete it at their convenience and in a way that made them feel at ease, which helped them provide objective responses. It also allowed data collection across a large geographic area at a lower cost than with phone, mail, or personal interviews. We adapted the questionnaires from prior scholars and tailored them to our context. This method is recommended in research because it provides established validity and reliability and reduces the time required to conduct further psychometric tests on the same study variables (Souza et al., 2017). The questionnaires were anchored on a

5-point Likert scale, with 1 denoting “strongly disagree” and 5 denoting “strongly agree.” The five-point Likert scale lowered respondents’ frustration while raising response rates and quality. Qualitatively, we used a survey guide and a list of documents to read and analyze both primary and secondary data.

3.9.1 *Measurement of variables*

This study measured four key constructs. These include: Interagency Collaboration, Disaster Preparedness, Risk Management, and Agile Response. We used structured questionnaire items derived from validated theoretical frameworks and prior empirical studies. All items were rated on a five-point Likert scale (1 = *Strongly Disagree*, 5 = *Strongly Agree*). The questionnaire was designed to capture dimensions relevant to humanitarian interagency coordination, drawing on theories and models from Gray [35], Simatupang and Sridharan [74, 75], Sutton and Tierney [82], and Beamon and Balcik [13]. Each construct was operationalized using multiple indicators representing its core dimensions, and composite indices were computed after confirming the reliability of each scale through Cronbach’s alpha.

Interagency Collaboration was assessed through six dimensions, including organizational structure, social capital, agency, information sharing, decision synchronization, and incentive alignment, adapted from Gray [35] and Simatupang and Sridharan [74, 75]. Disaster Preparedness was operationalized using Sutton and Tierney’s [82] framework, focusing on hazard knowledge, management direction and coordination, supportive resources, and life safety protection. Risk Management captured processes of risk identification, assessment, control, and monitoring based on Müller [49] and Johnson and Johnson [42]. Lastly, Agile Response was measured through indicators of response time, reliability, flexibility, process integration, and strategic targeting, as adapted from Beamon and Balcik [13] and Stewart and Ivanov [79].

For each construct, composite indices were generated by averaging validated items after confirming internal consistency, with Cronbach’s alpha values ranging from 0.80 to 0.87, indicating acceptable reliability across all measures. These indices formed the basis for subsequent regression and mediation analyses presented in Sect. 4.2 and 4.3.

Table 2 presents the operationalization of the study variables, outlining the dimensions, sample questionnaire items, theoretical underpinnings, and reliability coefficients. The items were adapted from validated scales and contextualized for Uganda’s humanitarian setting. After piloting and expert review, constructs with Cronbach’s alpha values above 0.70 were retained, indicating acceptable internal consistency. In total, all variables generated 19 closed-ended questions [54].

3.9.2 *Validity and reliability*

To ensure that the variables accurately measure what they are intended to measure, we conducted content validity in which academicians and practitioners tested the instruments before their final administration. Table 3 shows the Content Validity Index (CVI) for all the variables. Reliability indicates how consistently the instrument measures its intended quantity. This was computed using a Cronbach Alpha test, and any value above 0.70 was considered appropriate for the study, as suggested by Nunnally [54]. The content validity was above 0.70, which means the scale was valid.

Table 2 Operationalization and measurement of variables

Construct	Dimensions	Sample questionnaire items (5-point Likert Scale: 1 = Strongly disagree, 5 = Strongly agree)	Key theoretical sources	Reliability (Cronbach's α)
Interagency collaboration	Organizational Structure Social Capital Agency Information Sharing Decision Synchronization Incentive Alignment	"Our organization shares critical information with other agencies." "Decision-making processes are synchronized across collaborating organizations." "There are clear incentive structures for interagency cooperation."	Gray, [35]; (Simatupang and Sridharan, [74], [75])	0.87
Disaster preparedness	Hazard Knowledge Management Direction & Coordination Supportive Resources Life Safety Protection	"Our organization regularly conducts hazard mapping to guide preparedness." "Leadership ensures proper coordination in disaster planning." "Adequate resources are available to support disaster response."	Sutton and Tierney, [82]; Rodríguez-Espíndola [66]	0.82
Risk management	Risk Identification Risk Assessment Risk Control Risk Monitoring	"Potential operational risks are systematically identified." "We continuously monitor risks to adjust response strategies." "Contingency plans are regularly updated and tested."	Müller, [49]; Johnson and Johnson, [42]	0.80
Agile response	Response Time Reliability Flexibility Process Integration Strategic Targeting	"Our organization mobilizes rapidly during emergencies." "Relief operations remain reliable even under pressure." "Processes are integrated to ensure faster decision-making."	Beamon and Balcik, [13]; Stewart and Ivanov, [79]	0.85

Developed by authors from integrated literature [13, 35, 49, 74, 82].

Table 3 Reliability and validity

Variable	Anchor	Questionnaire items	Cronbach Alpha	Content Validity Index
Organizational collaboration	5 Point Scale	12	0.755	0.825
Disaster preparedness	5 Point Scale	7	0.738	0.847
Risk management	5 Point Scale	7	0.792	0.867
Agile response	5 Point Scale	5	0.803	0.820

3.9.3 Data processing, analysis, and presentation

The field data were collected and input into a computer using the Statistical Package for the Social Sciences (SPSS Version 23.0). The data was then organized, cleaned, and analyzed. Descriptive statistics were used to understand the characteristics of the respondents. Regression analysis was performed to determine the extent to which the independent variables predicted the dependent variable.

3.9.4 Triangulation

Consistent with a mixed-methods design, triangulation was employed to enhance the validity, credibility, and overall robustness of the findings. Quantitative, qualitative, and documentary data were collected and integrated at the interpretation stage, ensuring that conclusions were grounded in mutually reinforcing evidence across data sources. Integration was undertaken through theme-to-statistic triangulation, whereby qualitative themes were systematically compared with quantitative results to assess

convergence, elucidate divergences, and generate deeper contextual insights. This multi-source corroboration strengthened the analytical depth and enhanced the credibility and trustworthiness of the study's findings.

3.9.5 Ethical approval

All participants were provided with detailed information about the purpose of the study, the procedures undertaken, any potential risks, and the benefits of this research. This was aimed at obtaining informed consent from all the targeted research participants [55]. This informed consent was mutual and did not require any written consent, as no organizations or individual participants required it. To ensure confidentiality, no personally identifiable information was collected, and no organization was identified. Moreover, all data were assigned pseudonyms to anonymize identities during analysis. Data were securely stored and accessed only by the research team in accordance with institutional data protection and ethical guidelines.

4 Results

4.1 Response rate

We invited employees from 60 organizations to participate in the study. A minimum of three questionnaires were distributed to each organization, resulting in 180 questionnaires administered to purposively selected individuals. Of these, 142 were returned and deemed usable for subsequent analysis. This corresponds to a response rate of 78%, which is generally regarded as adequate and sufficiently representative to allow for the generalization of the study's findings (Fincham, 2008).

4.2 Organizational characteristics

The organizational attributes included the type of relief organization, the period it has been operating, the number of staff, and the approximate time it takes to respond to disasters. Table 4 shows the organizations' attributes.

Table 4 Organisation attributes, Total $N=60$ organisations

The type of relief aid organization offers	Count	Valid percent	Cumulative percent
Food security & livelihoods	10	16.8	16.8
Shelter and non-food Items	46	76.6	93.2
Health & Education	4	6.6	100.0
Period the organization has been operating			
Less than 5 years	5	8.3	8.3
6–10 years	50	83.4	91.7
11–15 years	5	8.3	100.0
Number of staff the organization has in total			
26–50	40	66.6	66.6
51–75	20	33.4	100.0
Approximate time taken by the organization to respond to a disaster			
Less than a Month	1	1.6	1.6
2–4 Months	29	48.4	50.0
5–7 Months	24	40.1	90.1
8–10 Months	5	8.3	98.4
Above 10 Months	1	1.6	100.0

Organizations that respond by providing shelter and non-food items comprised 76.6% of the sample. All Sectors are essential, but food is most needed when offering relief in disaster areas. Shelter and non-food items are required urgently when responding to disaster, so we have more organizations in this area than in any other relief item. Regarding the period these organizations have been operating, results show that organizations in this sector responding to disasters have been operating for 06 to 10 years (83.4%), demonstrating good experience in humanitarian engagements. Regarding staffing levels, the results indicate that the majority of organizations (66.6%) have between 25 and 50 staff members, suggesting a reasonable staffing level given the size and operational nature of these organizations. In terms of the period taken to respond to disasters, the majority of organizations (48.4%) spent between 2 and 4 months. This period is too long to save lives and property and provide psycho-social support, resettlement, and compensation for the victims. Table 5 shows respondents' characteristics.

Table 5 shows staff characteristics, which include gender, age, level of education, position held in the organization, and lastly, years of experience. Results show that more women (64.1%) responded to our questionnaire compared to 35.9% of men. The most vulnerable people who need humanitarian support are usually women and children. Women usually show more interest in rescuing fellow women and children than men. In terms of age group, young careers aged 31–35 years were willing to give their best humanitarian support services compared to other age groups. In terms of education, people with master's degrees accounted for 45.8%, degree holders 45.1%, followed by PhD holders with 4.9%, and the least had Diplomas with 4.2%. The implication is that our respondents were well educated to understand the questions in our research tools. The most significant profession was logistics management, at 31.7%. This is because,

Table 5 Respondents' characteristics total $N=142$

Gender	Count	Valid percent	Cumulative Percent
Male	51	35.9	35.9
Female	91	64.1	100.0
Age Group			
Less than 30 Yrs	13	9.2	9.2
31–35 Yrs	100	70.4	79.6
36–40 Yrs	19	13.4	93.0
41–45 Yrs	9	6.3	99.3
46 and above	1	0.7	100.0
Highest level of education			
Diploma	6	4.2	4.2
Degree	64	45.1	49.3
Masters	65	45.8	95.1
PhD	7	4.9	100.0
Position held in the organization			
Disaster Coordinator	30	21.1	21.1
Project Manager	28	19.7	40.8
Logistic Manager	45	31.7	72.5
Programme Manager	39	27.5	100.0
Period of working with this organization			
Less than 1 yr	6	4.2	4.2
2–4 yrs	46	32.4	36.6
5–7 yrs	57	40.1	76.8
8–10 yrs	29	20.4	97.2
Above 10 yrs	4	2.8	100.0

during a disaster, the logistics manager supports decision-making more, and more so on the quick procurement of the required items and fleet in terms of quick response. Followed by program managers, with 27.5%, Disaster Coordinators, accounting for 21.1%, and Project Managers, accounting for 19.7%. In terms of experience, 40.1% had spent 5–7 years, 32.4% had spent 2–4 years, while 20.4% had experience of 8–10. The least accounted for Less than 1 year with 4.2%, and Above 10 years with 2.8%. All our respondents had spent enough time in humanitarian operations for some time and therefore had good humanitarian experience.

4.3 The regression model

We performed a regression analysis to determine the effect of interagency collaboration, disaster preparedness, and risk management on the agility of response. The overall model was statistically significant, $F(3, 96) = 10.23$, $p < .001$, explaining 42.4% of the variance in agile response ($R^2 = 0.424$). Among the predictors, organizational collaboration was the strongest positive predictor ($\beta = 0.47$, $p = .001$), followed by disaster preparedness ($\beta = 0.31$, $p = .020$). In contrast, risk management was not a significant predictor ($\beta = 0.18$, $p = .176$). Tests of multicollinearity indicated no concerns, as all Variance Inflation Factor (VIF) values were below the recommended threshold of 5.0. These findings underscore the crucial role of fostering interagency collaboration in enhancing the effectiveness of agile responses. While the model accounts for 42.4% of the variance in agile response, it leaves 57.6% of the variation unexplained, highlighting the multifaceted nature of disaster management. Several external factors may contribute to this unexplained variance. Political interference, for instance, has significantly impacted the operational capacity of non-governmental organizations (NGOs) in Uganda (Table 6).

4.4 Mitigating endogeneity in the regression model

To address the potential issue of endogeneity in the regression model, several methodological precautions were undertaken to ensure the reliability of the estimated relationships. Endogeneity can arise from omitted variable bias, reverse causality, or measurement error, all of which could lead to biased and inconsistent estimates [100]. The predictors were selected based on prior empirical research and grounded theory that posits their directional influence on agile response, thereby reducing the likelihood

Table 6 Regression analysis results

	Unstandardized coefficients		Standardized coefficients	t	Sig.	VIF
	B	Std. Error	Beta			
(Constant)	0.172	0.857		0.201	0.842	
Interagency Collaboration	0.452	0.120	0.468	3.770	0.001	0.823
Disaster preparedness	0.355	0.150	0.312	2.367	0.020	0.801
Risk management	0.198	0.145	0.176	1.365	0.076	0.930
Dependent variable: agile response						
R	0.651					
R Square	0.424					
Adjusted R Square	0.385					
Std. Error	0.295					
F Statistic	10.231					
Sig.	0.001					

Source: Primary Data **Significant at the 0.01 level ($p < .01$); *Significant at the 0.05 level ($p < .05$)

of reverse causality [18]. Moreover, multicollinearity diagnostics were conducted to ensure that high intercorrelations between predictors did not distort the estimates.

4.5 Mediation analysis

To examine whether Disaster Preparedness and Risk Management statistically mediate the association between Interagency Collaboration and Agile Response, a mediation analysis was estimated based on the theoretical framework and guided by the regression results. The total effect of interagency collaboration on agile response was significant ($\beta = 0.468, p < .001$), suggesting that higher collaboration levels are linked to greater agile response. When Disaster Preparedness and Risk Management were introduced as potential mediators, the direct effect of interagency collaboration on agile response remained significant ($\beta = 0.252, p < .05$), indicating partial mediation. The indirect effect through Disaster Preparedness was significant ($\beta = 0.164, p < .05$), suggesting that collaboration may correspond with preparedness, which, in turn, is associated with an agile humanitarian response. In contrast, the indirect association through Risk Management was positive but statistically insignificant ($\beta = 0.052, p > .05$), suggesting that risk management does not meaningfully account for the association between collaboration and agility in this sample. Taken together, these results imply that Disaster Preparedness represents a more substantive indirect pathway in the model, although stronger causal inference would require longitudinal or experimental designs (See Fig. 3).

4.6 Direct and indirect effects

The findings from the mediation analysis indicate that Interagency Collaboration has both a direct and an indirect effect on Agile Response. As shown in Table 7, the total effect of interagency collaboration on agile response was significant ($\beta = 0.468, p = .001$), demonstrating its critical role in enhancing organizational responsiveness during disasters. When Disaster Preparedness and Risk Management were introduced as potential mediators, the direct effect of interagency collaboration on agile response remained significant ($\beta = 0.252, p = .035$), suggesting a significant association between collaboration and agility. Importantly, the indirect effect through Disaster Preparedness was significant ($\beta = 0.164, p = .021$), indicating that effective preparedness practices partially explain how interagency collaboration strengthens response capabilities. In contrast, the indirect effect through Risk Management was positive but statistically insignificant ($\beta = 0.052, p = .365$), implying that, within this context, risk management processes play a limited mediating role. These results collectively suggest partial mediation, where interagency

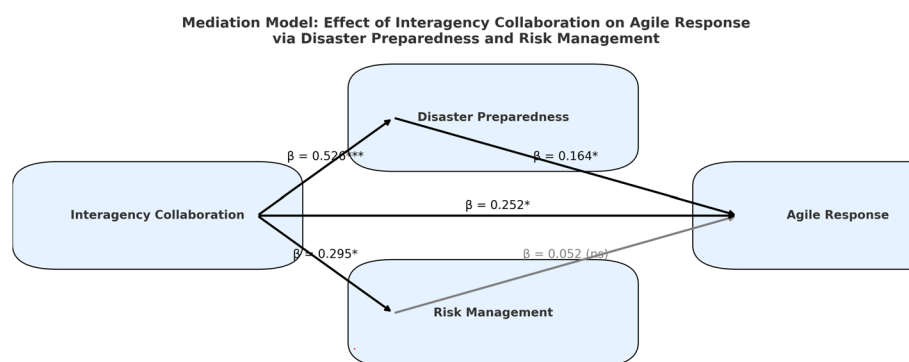


Fig. 3 Mediation analysis

Table 7 Direct and indirect effects of interagency collaboration on agile response

Effect	Path	β	SE	t / Z	p-value	95% Bootstrapped CI	Significance
Total effect	IC $\rightarrow$ AR	0.468	0.120	3.770	0.001	[0.230, 0.689]	Significant
Direct effect	IC $\rightarrow$ AR (controlling for DP & RM)	0.252	0.118	2.136	0.035	[0.018, 0.482]	Significant
Indirect effect 1	IC $\rightarrow$ DP $\rightarrow$ AR	0.164	0.070	2.343	0.021	[0.032, 0.309]	Significant
Indirect effect 2	IC $\rightarrow$ RM $\rightarrow$ AR	0.052	0.057	0.912	0.365	[-0.048, 0.152]	Not Significant
Total indirect effect	IC $\rightarrow$ DP & RM $\rightarrow$ AR	0.216	0.083	—	0.012	[0.069, 0.374]	Significant

Bootstrap resampling (5,000 samples) was used to test indirect effects. Results indicate that Disaster Preparedness significantly mediates the effect of Interagency Collaboration on Agile Response, whereas Risk Management does not

collaboration enhances agility both directly and indirectly through improved disaster preparedness, highlighting the critical importance of building robust preparedness frameworks within collaborative humanitarian systems.

5 Discussion

5.1 Interagency collaboration and agile response to humanitarian crises

According to Gharajedaghi [34], the urgent need to save lives and property during humanitarian crises depends on the extent of collaboration between diverse stakeholders delivering humanitarian services. Consistent with this theoretical perspective, [46] argue that interagency collaboration fosters effective resource coordination, while Obrecht [56] emphasizes its role in minimizing duplication of efforts, and Walden et al., [96] highlight its contribution to improving response times. Similarly, [38] emphasize how collaboration enhances the sharing of expertise and accountability among humanitarian actors. As earlier noted, individual organizations often lack the capacity to manage the scale and complexity of disaster events on their own. However, when agencies synchronize efforts under a unified humanitarian agenda, they create synergies that improve disaster preparedness, strengthen risk management, and enhance overall agility in emergency response.

The findings of the current regression analysis strongly support this theoretical reasoning. Results indicate that organizational collaboration is the most significant predictor of agile response ($\beta = 0.47$, $p = .001$), followed by disaster preparedness ($\beta = 0.31$, $p = .02$), while risk management shows a weaker, non-significant effect ($\beta = 0.18$, $p = .176$). The non-significance of risk management in predicting agile response ($\beta = 0.18$, $p = .176$) suggests that, while important theoretically, its practical influence is constrained within Uganda's humanitarian context. These findings imply that risk management mechanisms are largely reactive, fragmented, and insufficient without effective collaboration frameworks. This aligns with Gharajedaghi's [34] systems-thinking perspective, which emphasizes the interdependence of organizational subsystems in achieving collective outcomes. One of the respondents said,

"Potential threats are not well assessed because of the complex nature of the problems. Consequently, due to a lack of synchrony, each stakeholder conducts its own assessment, causing a difference in implementation strategies, which compromises the agile response."

"We could have saved many people in Bududa if our financiers had trusted the information given to them when we got early warning signals of the disasters and

provided us with enough resources to act. We gave them adequate information, but took too much time to respond, which failed our efforts to go to the field on time to save lives and property.” Respondent A – communications director from one of the humanitarian organizations.

The excerpts show fragmented risk management mechanisms, a lack of trust, and a commitment to provide logistical support to the field personnel. This consequently led to inadequate preparedness, which hindered agile responses to the existing humanitarian crises. When organization structures are not designed to create trust and commitment to save lives and property, it is implausible that they will have the capacity to prepare for disasters and manage humanitarian crisis risks [30].

“It is very difficult to know what our bosses are planning regarding the rescue activities. They decide when to intervene and not intervene based on their agenda. For us, we wait for their directives regarding the rescue activities.” Operations Manager – from one of the humanitarian agencies.

The excerpts reveal a pronounced power distance between employees and employers, sustained by organizational structures that undermine collaborative decision-making and relational engagement. Consequently, organizations struggle to share vital resources—such as information, food, clothing, and finances—during humanitarian crises [59]. As Neeley and Reiche [51] observe, when life-saving agencies face structural barriers to resource sharing, their disaster preparedness and risk management capacities are significantly weakened. Decision-making is often concentrated at the top leadership level, excluding valuable input from lower ranks and limiting collective participation. This exclusion erodes organizational cohesion and adaptive capacity. Notably, the Disaster Relief Act (2009), Article 15 A, reinforces organizational independence and hierarchical structures while imposing restrictions on inter-agency data, information, and resource sharing, further constraining coordinated humanitarian responses.

5.2 Disaster preparedness and agile response to humanitarian crises

Disaster preparedness is a significant predictor, accounting for nearly 11.9% of agile responses to humanitarian crises. The conceptual analysis showed that disaster preparedness comprises hazard knowledge, management direction and coordination, supportive resources, and life safety protection. These constructs are enhanced when supported by collaborative efforts. Firstly, understanding the various aspects of knowledge to enhance its implementation in policy and practice typically involves a collaborative effort, where multiple stakeholders come together to share valuable information through joint training and operations. This collaborative approach enables a deeper understanding of hazards, facilitating the development of strategies to either mitigate these hazards or identify the most effective methods for saving lives and property. Today, there are numerous information resources and knowledge systems focused on assessing and managing natural hazards. These aim to increase the use of knowledge through governmental programs, research projects, academic journals, public reports, research institutes, and advanced technology. These efforts are supported by scientists, private companies, practitioners, and non-governmental organizations (NGOs) from various fields. In addition to formal sources of knowledge, there is also a wealth of knowledge based on the experiences of communities, families, and individuals that is often

underutilized. Given the number of stakeholders involved and the disparate sources of knowledge production and management, a more collaborative perspective on knowledge production and sharing processes is crucial. It can help enhance the use of knowledge for better disaster risk reduction (DRR), including climate change adaptation (CCA), to avert its consequences. One of the informants remarked as follows:

In this humanitarian business, there is a lot to learn and share from one another. Anyone or organization that works alone misses out on so much information and knowledge from others, yet that is the knowledge that may be required to prepare and respond to the crises with agility.

The excerpt emphasizes that a lot of knowledge is generated by the various stakeholders operating in humanitarian crises, which calls for collaborative learning and sharing if organizations are to benefit from this knowledge base.

Similarly, adequate and quality supportive resources should be mobilized promptly and predictably to support preparedness and response to humanitarian and protection needs. Smith, [76] states that this requires collaborative efforts from which multi-year, predictable, and flexible funding can be mobilized from various stakeholders to reduce the gap between humanitarian needs and the resources available to meet them. Attracting internal and external funding to support disaster preparedness without the collaborative efforts of various stakeholders usually brings in little support, which cannot match the complexity of the humanitarian crises at hand [66]. Therefore, whereas disaster preparedness contributes directly to agile responses in humanitarian crises, it gains more significance from the collaborative efforts of various stakeholders, whose synergistic efforts provide all the resources required for agile responses. The following excerpts support this;

Our organization is financially incapacitated to respond well to crises, but when we work with other partners, we usually get enough resources, manpower, and even government support, which allows us to respond quickly to disasters.

5.3 Risk management and agile response to humanitarian crises

Although risk management exhibited a positive relationship with agile humanitarian response ($\beta = 0.176$), its effect was statistically insignificant ($p = .076$). This suggests that in Uganda's disaster management context, formalized risk frameworks contribute little once interagency collaboration and disaster preparedness are taken into account. Given institutional fragmentation, high power distance, and limited operational capacities, effective agility appears to rely more on collaborative structures and preparedness investments than on isolated risk plans.

This outcome may reflect the Ugandan disaster management context, where risk management frameworks are often formalized but weakly operationalized, constrained by limited resources, fragmented institutional mandates, and hierarchical governance structures outlined in the Disaster Relief Act (2009). From a Complex Adaptive Systems (CAS) perspective, agile response relies more on decentralized coordination, resource pooling, and real-time adaptability than on static risk registers or contingency plans. Consistent with [38] and [46], the findings underscore that effective risk reduction emerges when risk management is embedded within collaborative networks, supported by proactive preparedness measures that enhance organizational learning, shared

decision-making, and collective action during crises. Uganda's Disaster Response Plan (2020) highlights the strategic placement of operational centers, which are purposely designed to mitigate risks within disaster-prone zones, reinforcing the critical role of proactive risk management in agile humanitarian responses. However, this emphasis remains on paper without really establishing them on the ground, which compromises agile response. The quantitative findings are, however, contrary to our phenomenological findings, which emphasize the strategic importance of risk management in crisis handling. Thus;

“Operational centers equipped with tools, knowledge, and the ability to minimize risks should be strategically established in disaster-prone areas. These centers serve as critical nodes for the timely dissemination of information to relevant stakeholders, thereby facilitating a swift and effective response.” *Disaster Response Plan (2020), Office of the Prime Minister, Uganda.*

Our findings suggest that risk management, although conceptually critical, remains insufficiently effective in enhancing agile humanitarian responses within the Ugandan context. Despite ongoing efforts by the government and various stakeholders to implement risk management activities, these initiatives often lack the operational integration and collaborative alignment necessary to produce meaningful outcomes. As one respondent observed:

Managing risks in disaster-prone areas remains a mere desire of government bureaucrats upon which huge sums of resources are drawn. When you come on the ground, there is barely anything to show equivalent to the resources drawn from the government.

5.4 Limitations of the study and areas of further research

First, the cross-sectional survey design restricts causal inference, as relationships among interagency collaboration, disaster preparedness, risk management, and humanitarian agility were captured at a single point in time. Secondly, when data on predictors and outcomes are collected simultaneously from the same respondents, results may be affected by common methods bias, potentially inflating observed relationships [62]. Moreso, purposive sampling from 60 selected organizations limits the generalizability of the findings to all humanitarian actors in Uganda. Third, reliance on self-reported data introduces potential biases, including recall and social desirability effects, which may have influenced responses. Additionally, the study focused on three primary variables, excluding other potentially significant factors such as political interference, donor dynamics, funding flows, technological readiness, and community-level resilience, which may account for part of the unexplained variance in humanitarian agility. Finally, the absence of longitudinal or real-time crisis data limits insights into how interagency collaboration mechanisms evolve during different stages of disaster response. Future research should adopt longitudinal, mixed-methods, and structural equation modeling (SEM) approaches to better capture dynamic interagency processes and uncover additional determinants of organizational agility.

6 Conclusion

Disaster preparedness and coordinated disaster response systems are shaped by organizational structure, social capital, and institutional agency. Evidence from recent crises such as the Kiteezi landfill disaster, the Mount Elgon landslides, and the Rwenzori floods illustrates that more coherent interagency engagement, the ones that align organizational structure, social capital, and agency with humanitarian needs, could significantly increase organizational agility in the mitigation of humanitarian losses. The current study, in line with other studies such as Bwambale et al., [21], confirms that collaborative engagements foster trust, collaborative resource pooling, information sharing, collaborative decision-making, and the integration of technological solutions, all of which are central to humanitarian agility. However, the present study finds that risk management, although theoretically important in disaster governance, does not significantly predict agile response in Uganda's humanitarian context. Rather than attempting to explain this away, the finding suggests that formal risk management practices remain weakly embedded, fragmented across institutions, or insufficiently linked to operational decision-making. This empirical divergence invites a reconsideration of prevailing assumptions that risk management functions inherently translate into adaptive or agile response capabilities. Instead, the study highlights interagency collaboration and decentralized coordination mechanisms as more influential drivers of system-wide agility. Accordingly, policy and institutional reforms should prioritize collaborative arrangements, semi-formal networks, and joint decision-making architectures that enable information sharing and synchronized action across agencies. It is through these collective mechanisms—rather than isolated or procedural risk management efforts—that Uganda's humanitarian ecosystem can cultivate more agile, resilient, and contextually responsive disaster management systems.

6.1 Recommendations

At the organizational level, the findings suggest that humanitarian agencies can strengthen agile response capacities by institutionalizing interactive, relationship-oriented activities and preparedness mechanisms. This includes formalizing coordination protocols, enhancing information sharing, decentralizing decision-making and power relations, and establishing liaison functions to reduce duplication of effort and transaction costs during joint operations. Organizations would further benefit from embedding preparedness into strategic planning cycles, regularly updating contingency plans, and promoting organizational learning through after-action reviews and knowledge retention systems. Investing in staff competencies, particularly in adaptive decision-making, cross-functional teamwork, and operational problem-solving, may also enhance agility in rapidly evolving crises. Moreover, cultivating trust-based interorganizational relationships and aligning internal incentives with collaborative and preparedness outcomes can reinforce the relational and behavioral dimensions of agility. Taken together, these organizational interventions provide a more empirically grounded and theoretically consistent pathway for improving humanitarian responsiveness.

At the national level, it is recommended that Parliament amend the Disaster and Relief Act (2009) and the Disaster Policy Act (2015), as well as other relevant statutes governing governmental and non-governmental organizations engaged in humanitarian services. These amendments should explicitly encourage these organizations to

pursue collaborative partnerships to enhance disaster preparedness and reduce reliance on isolated risk management practices, thereby fostering an agile, coordinated response among humanitarian actors. Furthermore, the governing bodies of Civil Society Organizations—such as the Red Cross, World Vision, the World Food Programme, fire brigades, Red Crescent/Red Cross Societies, international agencies, and NGOs involved in emergency response operations—should consider restructuring their operations to promote internal and cross-organizational collaboration, which is essential for fulfilling their humanitarian mandates.

In addition to fostering such collaboration through encouragement and light enforcement, the Ugandan government, alongside the United Nations Office responsible for disaster management, should establish incentives for stakeholders who actively engage in joint efforts to address humanitarian crises. These incentives could include tax exemptions for equipment used by relief agencies, removing the mandatory Pay As You Earn Tax on the salaries of relief workers, and providing emergency office operations and rescue centers. Such measures would significantly enhance collaborative efforts to improve the operational effectiveness of humanitarian organizations in responding to emergencies. Subsequently, the organizations' management teams will depart from pursuing individual services and revise their human resources manuals and modes of operation to decentralize and democratize operations, thereby increasing the likelihood of collaboration.

A policy aimed at educating communities on disaster preparedness serves as a foundational strategy for building collaborative resilience and reducing vulnerability to both natural and human-induced hazards. Such a policy emphasizes the dissemination of knowledge regarding the nature and causes of disasters, thereby fostering a deeper understanding of potential threats. It incorporates the promotion of early warning systems to ensure timely responses and advocates for comprehensive community vulnerability and risk assessments to identify and address specific local hazards. Furthermore, the policy supports the mobilization and equitable distribution of resources, encouraging collective action and mutual aid during and after disaster events. By enhancing local capacity through education and collaboration, the policy contributes to the development of more adaptive and self-reliant communities capable of effectively managing disaster risks.

If the above recommendations are implemented, there is a likelihood of collective decision-making, reduced hierarchy of authority, interactive and relational-based job descriptions, relaxed rule observation, and increased social capital based on trust, mutuality, and reciprocity. We are also likely to see organizations' agency decisions change from individualism to collectivism. All these are likely to improve collaboration and consequently improve the extent to which organizations effectively respond to humanitarian crises with agility.

Author contributions

The corresponding author is entirely responsible for this manuscript. All efforts in conceptualization, methodology, statistical analyses, and discussion are attributed to the corresponding author.

Funding

This research did not receive any funding from any individual or organization.

Data availability

The datasets generated during and/or analysed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

This study was conducted in accordance with the principles of the Declaration of Helsinki. Approval was granted by the Research Ethics Committee (REC) of Makerere University on June 10, 2022, with approval number MUBSREC/0023/2022.

Informed consent

We obtained informed consent from the study participants.

Consent for publication

We obtained consent to participate and consent to publish from all participants.

Competing interests

The authors declare no competing interests.

Received: 30 October 2025 / Accepted: 11 March 2026

Published online: 24 March 2026

References

1. Adams WC. (2015). Conducting semi-structured interviews. *Handbook of practical program evaluation*, pp. 492–505.
2. Ahmed W, Huma S. Impact of lean and agile strategies on supply chain risk management. *Total Qual Manage Bus Excellence*. 2021;32(1–2):33–56.
3. Ansell, C., & Gash, A. (2008). Collaborative governance in theory and practice. *Journal of public administration research and theory*, 18(4), 543–571.
4. Ario AR, Makumbi I, Bulage L, Kyazze S, Kayiwa J, Wetaka MM, Ocom F. The logic model for Uganda's health sector preparedness for public health threats and emergencies. *Global health action*. 2019;12(1):1664103.
5. Appleby JA, King N, Saunders KE, Bast A, Rivera D, Byun J, Duffy AC. (2022). Impact of the COVID-19 pandemic on the experience and mental health of university students studying in Canada and the UK: A cross-sectional study. *BMJ open*, 12(1), e050187.
6. Avant, D. D., Finnemore, M., & Sell, S. K. (Eds.). (2010). *Who governs the globe?* (Vol. 114). Cambridge University Press.
7. Ayeb-Karlsson S, Kniveton D, Cannon T, Van Der Geest K, Ahmed I, Derrington EM, Opondo DO. I will not go, I cannot go: cultural and social limitations of disaster preparedness in Asia, Africa, and Oceania. *Disasters*. 2019;43(4):752–70.
8. Baharmand, H., Comes, T., & Luras, M. (2017). Towards designing and implementing an empirically grounded research for humanitarian logistics after nepal earthquake. In *Annual NOFOMA conference 2017* (pp. 1–16).
9. Baharmand, H., Maghsoudi, A., & Coppi, G. (2021). Exploring the application of blockchain to humanitarian supply chains: insights from Humanitarian Supply Blockchain pilot project. *International Journal of Operations & Production Management*, 41(9), 1522–1543.
10. Balsari S, Kiang MV, Buckee CO. Data in crisis—Rethinking disaster preparedness in the United States. *N Engl J Med*. 2021;385(16):1526.
11. Barbelet, V. (2019). Rethinking capacity and complementarity for a more local humanitarian action.
12. Barnett, M., & Duvall, R. (2005). Power in international politics. *International organization*, 59(1), 39–75.
13. Beamon BM, Balcik B. Performance measurement in humanitarian relief chains. *Int J Public Sector Manag*. 2008;21(1):4–25.
14. Bhakta Bhandari R. Social capital in disaster risk management; a case study of social capital mobilization following the 1934 Kathmandu Valley earthquake in Nepal. *Disaster Prev Manage*. 2014;23(4):314–28.
15. Bennett, P, Foley, K., Green, D. A., & Salvanes, K. G. (2024). Education and inequality: an international perspective. *Fiscal Studies*, 45(3), 429–454.
16. Birchley G. Deciding together? Best interests and shared decision-making in pediatric intensive care. *Volume 22. Health Care Analysis*; 2014. pp. 203–22.
17. Boin, A., & Lodge, M. (2016). Designing resilient institutions for transboundary crisis management: A time for public administration. *Public administration*, 94(2), 289–298.
18. Boin A, Lodge M. Responding to the COVID-19 crisis: a principled or pragmatist approach? *J Eur Public Policy*. 2021;28(8):1131–52.
19. Bronfman NC, Cisternas PC, Repetto PB, Castañeda JV. (2019). Natural disaster preparedness in a multi-hazard environment: Characterizing the sociodemographic profile of those better (worse) prepared. *PLoS ONE*, 14(4), e0214249.
20. Butcher J, Gilchrist D. Collaboration for Impact: Lessons from the field. *ANU*; 2020. p. 250.
21. Bwambale B, Nyeko M, Sekajugo J, Kervyn M. The essential contribution of indigenous knowledge to understanding natural hazards and disaster risk: historical evidence from the Rwenzori (Uganda). *Natural Hazards*; 2022. pp. 1–21.
22. Cai J, Sun F, Hu S, Li H, Xing H. Research on cross-organizational emergency collaboration networks based on functional modules: An example of landslide disaster incident in Shuicheng, Guizhou, China. *Int J Disaster Risk Reduct*. 2023;97:104043.
23. Chomsky N, Pollin R. *Climate crisis and the global green new deal: The political economy of saving the planet*. Verso Books; 2020.
24. Coghlan MC, Ross AB, Russell MB. (2023). *Why Fear Crushes Your Culture*. In *Organizational Behavior-Negative Aspects*. IntechOpen.
25. Comfort, L. K. (2019). The dynamics of risk: Changing technologies and collective action in seismic events.
26. Comfort, L. K., Kapucu, N., Ko, K., Menoni, S., & Siciliano, M. (2020). Crisis decision-making on a global scale: transition from cognition to collective action under threat of COVID-19. *Public Administration Review*, 80(4), 616–622.
27. Dahal GR, Adhikari KP. Bridging, linking, and bonding social capital in collective action: The case of Kalahan Forest Reserve in the Philippines; 2008.
28. Donini, A. (2012). Humanitarianism, perceptions, power. In *the Eyes of Others*, 183.

29. Donini, A. (Ed.). (2012). *The golden fleece: manipulation and independence in humanitarian action* (Vol. 147). Sterling, VA: Kumarian Press.
30. Dubey R, Altay N, Blome C. Swift trust and commitment: The missing links for humanitarian supply chain coordination? *Ann Oper Res*. 2019;283:159–77.
31. Eason A, Clegg V. *Research Methodologies: Research Who? A Police Officer's Guide to Academic Research*. Cham: Springer International Publishing; 2023. pp. 57–71.
32. Erbeyoglu G, Bilge Ü. A robust disaster preparedness model for effective and fair disaster response. *Eur J Oper Res*. 2020;280(2):479–94.
33. Fincham, J. E. (2008). Response rates and responsiveness for surveys, standards, and the Journal. *American journal of pharmaceutical education*, 72(2).
34. Gharajedaghi J. *Systems thinking: Managing chaos and complexity: A platform for designing business architecture*. Elsevier; 2011.
35. Gray B. (1989). Collaborating: Finding common ground for multiparty problems.
36. Hennink M, Kaiser BN. Sample sizes for saturation in qualitative research: A systematic review of empirical tests. *Soc Sci Med*. 2022;292:114523.
37. Hey B. (2017). *Learning and Working Together: Invoking Systems' Change Through Inter-Organizational Collaborative Principles and a Learning Community Framework*.
38. Hilhorst D, Melis S, Mena R, van Voorst R. Accountability in humanitarian action. *Refugee Surv Q*. 2021;40(4):363–89.
39. Insecurity F. (2015). *Africa Research Bulletin*.
40. International Organization for Migration (IOM). April 2024. Uganda Multi-hazard Infographic. IOM Uganda.
41. John J, Eappen NJ. Working principle of agile capabilities for emergency response during cyclones and floods. *Int J Emerg Serv*. 2024;13(1):33–49.
42. Johnson DW, Johnson RT. Cooperative, competitive, and individualistic learning environments. *International guide to student achievement*. Routledge; 2013. pp. 372–4.
43. Kabesime E, Owuor C, Barihaihi M, Kajumba T. Monitoring and evaluating climate change adaptation and disaster risk reduction in Uganda. *International Institute for Environment and Development*; 2015.
44. Kapucu, N. (2012). Disaster and emergency management systems in urban areas. *Cities*, 29, S41–S49.
45. Khan H, Moazzam A. (2022). *Interagency Collaboration/Coordination. Public Sector Reforms in Pakistan: Hierarchies, Markets and Networks*, 153.
46. Lotfi T, Bou-Karroum L, Darzi A, Hajjar R, El Rahyel A, Eid E, Akl J. E. (2016). Coordinating the provision of health services in humanitarian crises: a systematic review of suggested models. *PLoS Curr*, 8.
47. Majka, M. (2024). Weighted average cost of capital.
48. Meydan CH, Akkas H. The role of triangulation in qualitative research: Converging perspectives. *Principles of conducting qualitative research in multicultural settings*. IGI Global; 2024. pp. 98–129.
49. Müller M. Assemblages and actor-networks: Rethinking socio-material power, politics and space. *Geogr compass*. 2015;9(1):27–41.
50. Munasinghe NL, Matsui K. Examining disaster preparedness at Matara district general hospital in Sri Lanka. *Int J Disaster Risk Reduct*. 2019;40:101154.
51. Neeley T, Reiche BS. How global leaders gain power through downward deference and reduction of social distance. *Acad Manag J*. 2022;65(1):11–34.
52. Nipa TJ, Kermanshachi S, Patel R, Tafazzoli M. (2020, September). Disaster preparedness education: construction curriculum requirements to increase students' preparedness in pre-and post-disaster activities. In *Associated Schools of Construction (ASC) International Conference* (pp. 142 – 131).
53. Ntale PD, Ssempebwa J. Designing organizations for collaborative relationships: the amenability of social capital to inter-agency collaboration in the graduate employment context in Uganda. *Empl Responsibilities Rights J*. 2022;34(3):291–318.
54. Nunnally JC. (1978). An overview of psychological measurement. *Clinical diagnosis of mental disorders: A handbook*, 97–146.
55. Nusbaum L, Douglas B, Damus K, Paasche-Orlow M, Estrella-Luna N. Communicating risks and benefits in informed consent for research: a qualitative study. *Global qualitative Nurs Res*. 2017;4:2333393617732017.
56. Obrecht A. Using evidence to allocate humanitarian resources: challenges and opportunities. London: ALNAP/ODI; 2017.
57. Ochsner M. (2021). Representativeness of surveys and its analysis. *FORS Guides*, (15).
58. Onifade M. Towards an emergency preparedness for self-rescue from underground coal mines. *Process Saf Environ Prot*. 2021;149:946–57.
59. Oruh ES, Dibia C. Employee stress and the implication of high-power distance culture: empirical evidence from Nigeria's employment terrain. *Empl Relations: Int J*. 2020;42(6):1381–400.
60. Paton, D., & Johnston, D. (2017). *Disaster resilience: an integrated approach*. Charles C Thomas Publisher.
61. Phookan H, Sharma RR. Subsidiary power, cultural intelligence and interpersonal knowledge transfer between subsidiaries within the multinational enterprise. *J Int Manag*. 2021;27(4):100859.
62. Podsakoff PM, MacKenzie SB, Lee JY, Podsakoff NP. Common method biases in behavioral research: a critical review of the literature and recommended remedies. *J Appl Psychol*. 2003;88(5):879.
63. Provan, K. G., & Kenis, P. (2008). Modes of network governance: Structure, management, and effectiveness. *Journal of public administration research and theory*, 18(2), 229–252.
64. Qazi A, Akhtar P. Risk matrix driven supply chain risk management: Adapting risk matrix based tools to modelling interdependent risks and risk appetite. *Comput Ind Eng*. 2020;139:105351.
65. Roberts NC. Beyond smokestacks and silos: Open-source, web-enabled coordination in organizations and networks. *Public Adm Rev*. 2011;71(5):677–93.
66. Rodríguez-Espíndola O, Albores P, Brewster C. Disaster preparedness in humanitarian logistics: A collaborative approach for resource management in floods. *Eur J Oper Res*. 2018;264(3):978–93.
67. Rukundo PM, Iversen PO, Oshaug A, Omuajuanfo LR, Rukooko B, Kikafunda J, Andreassen BA. Food as a human right during disasters in Uganda. *Food Policy*. 2014;49:312–22.
68. Rulinawaty SA, Samboteng L. Leading agile organization can Indonesian bureaucracy become agile. *J Talent Dev Excellence*. 2020;12(3):330–8.

69. Ryan DH, Ravussin E, Heymsfield S. (2020). COVID 19 and the patient with obesity—the editors speak out. *Obesity* (Silver Spring, Md.), 28(5), 847.
70. Sari B, Özer YE. Coordination analysis in disaster management: A qualitative approach in Türkiye. *Int J Disaster Risk Reduct.* 2024;100:104168.
71. Semyonov-Tal K, Lewin-Epstein N. The importance of combining open-ended and closed-ended questions when conducting patient satisfaction surveys in hospitals. *Health Policy OPEN.* 2021;2:100033.
72. Serwajja E, Kisira Y, Bamutaze Y. Better to die of landslides than hunger: Socio-economic and cultural intricacies of resettlement due to climate-induced hazards in Uganda. *Int J Disaster Risk Reduct.* 2024;101:104242.
73. Sileyew KJ. (2019). Research design and methodology (Vol. 7). Cyberspace.
74. Simatupang TM, Sridharan R. Benchmarking supply chain collaboration: an empirical study. *Benchmarking: Int J.* 2004;11(5):484–503.
75. Simatupang TM, Sridharan R. Complementarities in supply chain collaboration. *Ind Eng Manag Syst.* 2018;17(1):30–42.
76. Smith G. (2021). Overcoming barriers to coordinating across social protection and humanitarian assistance: building on promising practices. Policy paper. June. Social Protection Approaches to Covid-19: Expert advice (SPACE). <https://www.calnetnetwork.org/publication/space-overcoming-barriers-to-coordinating-across-social-protection-and-humanitarian-assistance-building-on-promising-practices/> (last accessed on 12 November 2021).
77. Son BG, Roscoe S, Sodhi MS. Dynamic capabilities of global and local humanitarian organizations with emergency response and long-term development missions. *Int J Oper Prod Manage.* 2025;45(1):1–32.
78. Sridharan R, Simatupang TM. Power and trust in supply chain collaboration. *Int J value chain Manage.* 2013;7(1):76–96.
79. Stewart M, Ivanov D. Design redundancy in agile and resilient humanitarian supply chains. *Ann Oper Res.* 2022;319(1):633–59.
80. Stout W, Heazlewood N, Cook E. Technology and Technological Methods in Disaster Response. *The Routledge Handbook of Disaster Response and Recovery.* Routledge; 2025. pp. 217–32.
81. Stumpf J, Besiou M, Wakolbinger T. Supply chain preparedness: How operational settings, product and disaster characteristics affect humanitarian responses. *Prod Oper Manage.* 2023;32(8):2491–509.
82. Sutton J, Tierney K. (2006). Disaster preparedness: Concepts, guidance, and research. Colorado: University of Colorado, 3(1), 3–12.
83. Taskiran G, Baykal U. Nurses' disaster preparedness and core competencies in Turkey: a descriptive correlational design. *Int Nurs Rev.* 2019;66(2):165–75.
84. Tavares, F., Santos, E., Diogo, A., & Ratten, V. (2021). Teleworking in Portuguese communities during the COVID-19 pandemic. *Journal of Enterprising Communities: people and places in the global economy*, 15(3), 334–349.
85. Thaler T, Seebauer S. Bottom-up citizen initiatives in natural hazard management: Why they appear and what they can do? *Environ Sci Policy.* 2019;94:101–11.
86. Tierney, J. E., Haywood, A. M., Feng, R., Bhattacharya, T., & Otto-Bliesner, B. L. (2019). Pliocene warmth consistent with greenhouse gas forcing. *Geophysical Research Letters*, 46(15), 9136–9144.
87. Tierney, R. J. (2019). Notes on global reading: Critical cultural traversals, transactions and transformations. In *Exploring the Complexities in Global Citizenship Education* (pp. 38–68). Routledge.
88. Tillmar M. Practicing participant observations: capturing entrepreneurial practices. *Research handbook on entrepreneurial behavior, practice and process.* Edward Elgar Publishing; 2020. pp. 168–81.
89. Tschirhart M, Christensen RK, Perry JL. The paradox of branding and collaboration. *Public Perform Manage Rev.* 2005;29(1):67–84.
90. Uganda Multi-Hazard Infographics (2024) International Organization for Migration (IOM), April 2024. Uganda multi-hazard: https://efaidnbmnnnibpccjpcglclefindmkaj/https://uganda.iom.int/sites/g/files/tmzbd11376/files/documents/2024-06/4-iom_uganda_multi-hazard_infographic_april_2024.pdf
91. Uhl-Bien, M., & Arena, M. (2018). Leadership for organizational adaptability: A theoretical synthesis and integrative framework. *The leadership quarterly*, 29(1), 89–104.
92. Umar M, Wilson M. Supply chain resilience: Unleashing the power of collaboration in disaster management. *Sustainability.* 2021;13(19):10573.
93. UNDRR (2015): <https://www.undrr.org/publication/global-assessment-report-disaster-risk-reduction-2015>
94. Vangen S, Huxham C. (2005). Aiming for collaborative advantage: Challenging the concept of shared vision. *Advanced Institute of Management Research Paper*, (015).
95. Verheul ML, Dücker ML. Defining and operationalizing disaster preparedness in hospitals: a systematic literature review. *Prehosp Disaster Med.* 2020;35(1):61–8.
96. Walden VM, Scott I, Lakeman J. Snapshots in time: using real-time evaluations in humanitarian emergencies. *Disaster Prev Management: Int J.* 2010;19(3):283–90.
97. Walker, P., & Maxwell, D. (2014). *Shaping the humanitarian world.* Routledge.
98. Wankmüller C, Reiner G. Coordination, cooperation and collaboration in relief supply chain management. *J Bus Econ.* 2020;90:239–76.
99. Witter S, Bertone MP, Dale E, Jowett M. (2020). Health financing in fragile and conflict-affected situations: a review of the evidence.
100. Wooldridge JM. *Introductory Econometrics: A Modern Approach.* 6rd ed. Cengage learning; 2016.

Publisher's Note

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.