Journal of Economics and Behavioral Studies (ISSN: 2220-6140)
Vol. 18, No. 3, pp. 1-18, 2026

Linking Big Data Analytics Capabilities to Humanitarian Supply Chain Resilience: The Mediating Mechanism of Inter-Organizational Coordination

*Wilbroad Aryatwijuka[1], Henry Mutebi[2], Ronald Twongyirwe[3], Naster Tumebembeire[4], Miriam Tugiramasiko[5]
[1]Department of Procurement and Marketing, Mbarara University of Science and Technology (MUST), Uganda
[2]Department of Procurement and Supply Chain Management, Makerere University Business School, Uganda
[3]Department of Environment and Livelihoods Support Systems, Mbarara University of Science and Technology (MUST), Uganda
[4]Department of Accounting and Finance, Mbarara University of Science and Technology (MUST), Uganda
[5]Department of Human Resource Management, Mbarara University of Science and Technology (MUST), Uganda
Email: *waryatwijuka@must.ac.ug, hemutebi@gmail.com, rtwongyirwe@must.ac.ug, tnaster@must.ac.ug, miriamt@must.ac.ug
Corresponding Author: Dr Wilbroad Aryatwijuka

Abstract: This study examines the relationships among big data analytics capabilities, inter-organizational coordination capabilities and humanitarian supply chain resilience. Drawing on Dynamic Capability Theory (DCT), the study explains how humanitarian organizations leverage data analytics and inter-organizational coordination to strengthen supply chain resilience in uncertain and disruption-prone environments. A quantitative cross-sectional survey was conducted among 88 humanitarian organizations operating in Uganda. Data were analyzed using partial least squares structural equation modeling (PLS-SEM) in SmartPLS to assess the hypothesized direct relationships and the mediating effect of IOCC. The findings reveal that BDAC has a significant positive effect on both IOCC and HSCR. IOCC also significantly enhances HSCR. Furthermore, IOCC partially mediates the relationship between BDAC and HSCR, indicating that the resilience benefits of big data analytics arise both directly and indirectly through strengthened inter-organizational coordination. The cross-sectional design limits the ability to capture how analytics capabilities, coordination mechanisms, and resilience evolve. Future research could employ longitudinal and qualitative designs to examine the dynamic processes through which humanitarian organizations develop and deploy these capabilities across different stages of disruptions. Humanitarian organizations should complement investments in big data analytics and digital infrastructure with mechanisms that strengthen information sharing, joint planning, resource coordination, and collaborative decision-making among supply chain partners. Integrating analytics with strong coordination capabilities can improve preparedness, responsiveness, and recovery from humanitarian supply chain disruptions. This study extends the application of DCT to humanitarian supply chains by demonstrating that IOCC constitutes an important mechanism through which BDAC translates into HSCR.

Keywords: *Big data analytics capabilities; inter-organizational coordination capabilities; humanitarian supply chain resilience; dynamic capability theory; humanitarian organizations; Uganda; PLS-SEM.*

1. Background of the Study

The increasing frequency, severity, and complexity of humanitarian emergencies have heightened concerns about the capacity of humanitarian supply chains to respond effectively. In 2023, 399 natural-hazard-related disasters affected approximately 93.1 million people and caused 86,473 deaths globally (CRED, 2024). Such disruptions disproportionately affect resource-constrained regions, including Sub-Saharan Africa, where inadequate infrastructure, financial resources, information systems, and institutional capacity can constrain humanitarian response. Uganda remains particularly vulnerable to recurrent floods and landslides. For example, the May 2020 floods and landslides in Kasese District damaged roads, bridges, schools, health facilities, and other critical infrastructure (Kasese District Local Government, 2020). These challenges are compounded by Uganda's substantial refugee burden, with more than 1.5 million refugees hosted in 2024 (UNHCR, 2025). The COVID-19 pandemic further exposed vulnerabilities in humanitarian supply chains through movement restrictions, supply shortages, shifting demand, and disruptions to procurement and transportation. In Uganda, relief operations were additionally affected by logistical bottlenecks, procurement challenges, fragmented information flows, and weaknesses in beneficiary data management (Aryatwijuka et al., 2023). These experiences demonstrate the need for humanitarian organizations to anticipate disruptions, generate timely information, coordinate multiple actors, and rapidly adapt their operations.

These challenges underscore the importance of Humanitarian Supply Chain Resilience (HSCR), which reflects the capacity of humanitarian supply chains to anticipate, withstand, adapt to, and recover from disruptions while maintaining or rapidly restoring essential services. Previous studies identify flexibility, integration, collaboration, visibility, procurement effectiveness, and other organizational capabilities as important resilience enablers (Pereira et al., 2019; Iftikhar et al., 2021). Recent research, however, suggests that resilience increasingly depends on complementary configurations of technological, operational, and relational capabilities (Jiang et al., 2024). Consequently, attention has shifted towards Big Data Analytics Capabilities (BDAC), which enable organizations to mobilize data, technological, human, and managerial resources to generate actionable insights from large and diverse datasets. In humanitarian operations, BDAC can improve needs forecasting, disruption detection, resource allocation, beneficiary targeting, decision-making, and operational visibility. Recent evidence demonstrates that BDAC contributes to resilience through complementary capabilities such as supply chain integration and flexibility (Jiang et al., 2024; Lee et al., 2024), while humanitarian-specific evidence links BDAC, information alignment, and collaboration to HSCR (Tetteh et al., 2024).

Nevertheless, the resilience value of BDAC may not be fully realized without Inter-Organizational Coordination Capabilities (IOCC) that translate analytical intelligence into collective action. IOCC reflects organizations' capacity to coordinate across organizational boundaries through information sharing, joint planning, role alignment, collaborative decision-making, and synchronized resource deployment. This is particularly important in humanitarian operations involving multiple interdependent actors, including humanitarian organizations, governments, donors, suppliers, logistics providers, local authorities, and affected communities. Although BDAC may identify emerging needs, shortages, vulnerable populations, and operational disruptions, such intelligence may have limited value where actors cannot jointly interpret information and coordinate decisions and resources. Inadequate coordination can contribute to duplication, logistical difficulties, inefficient resource utilization, and delayed humanitarian assistance (European Commission, 2024). Thus, BDAC provides analytical intelligence, while IOCC enables that intelligence to be transformed into coordinated humanitarian action and resilience.

Despite growing research on BDAC and supply chain resilience, the mechanisms through which analytics capabilities generate resilience in humanitarian supply chains remain insufficiently understood. Recent studies have examined complementary mechanisms including supply chain integration (Jiang et al., 2024), flexibility (Lee et al., 2024), information alignment and collaboration (Tetteh et al., 2024), and organizational ambidexterity (Kong & Feng, 2025). However, comparatively limited empirical attention has been devoted to IOCC as a mediating mechanism between BDAC and HSCR, particularly in resource-constrained Sub-Saharan African humanitarian settings. This gap is important because humanitarian supply chains are inherently inter-organizational and depend on multiple actors transforming information into coordinated decisions and collective action.

Drawing on Dynamic Capability Theory (DCT), this study examines the relationships among BDAC, IOCC, and HSCR. DCT argues that organizations operating in dynamic environments require capabilities to sense changes, seize appropriate responses, and reconfigure resources as conditions evolve (Teece et al., 1997; Teece, 2007). In this study, BDAC primarily strengthens sensing by enabling humanitarian organizations to identify and interpret emerging disruptions, while IOCC facilitates seizing and reconfiguration through joint planning, information sharing, resource mobilization, and coordinated action. Accordingly, the study examines the direct effects of BDAC on IOCC and HSCR, the effect of IOCC on HSCR, and the mediating role of IOCC in the relationship between BDAC and HSCR among humanitarian organizations operating in Uganda. In doing so, the study extends DCT to humanitarian supply chains and demonstrates how analytical and inter-organizational capabilities jointly contribute to resilience in a resource-constrained context.

The remainder of the paper is organized as follows. Section 2 presents the theoretical foundation and literature review; Section 3 describes the methodology; Section 4 presents the empirical findings and hypothesis testing; and Section 5 discusses the theoretical and practical implications, limitations, and directions for future research.

2. Theoretical Framework and Development of Hypotheses

The Dynamic Capabilities Theory

This study is anchored in Dynamic Capability Theory (DCT), which explains how organizations operating in uncertain environments integrate and reconfigure resources and competencies to respond to change (Teece et al., 1997; Eisenhardt & Martin, 2000; Teece, 2007). DCT conceptualizes dynamic capabilities around three interrelated processes: sensing, seizing, and reconfiguration. These processes are particularly relevant to humanitarian supply chains, where organizations must continuously detect disruptions, mobilize resources, coordinate multiple actors, and adapt operations under conditions of uncertainty and resource constraints.

Within this study, Big Data Analytics Capabilities (BDAC) primarily represent a sensing capability. BDAC enables humanitarian organizations to collect, integrate, and analyze data from multiple sources to identify emerging risks, forecast humanitarian needs, detect supply chain bottlenecks, and improve situational awareness. Recent evidence indicates that BDAC contributes to supply chain resilience, particularly when complemented by other organizational capabilities (Jiang et al., 2024; Lee et al., 2024; Kong & Feng, 2025).

Inter-Organizational Coordination Capabilities (IOCC) facilitate seizing and reconfiguration by enabling humanitarian organizations to share information, undertake joint planning, synchronize decisions, mobilize complementary resources, and coordinate activities with external partners. IOCC therefore enables organizations to translate intelligence generated through BDAC into coordinated action and to reconfigure resources and operational arrangements as humanitarian conditions change.

The complementarity between these capabilities provides the central theoretical mechanism underlying HSCR: BDAC (sensing) → analytical intelligence → IOCC (seizing and reconfiguration) → coordinated humanitarian action → HSCR.

DCT also explains the proposed mediating role of IOCC. While BDAC can directly enhance HSCR through improved forecasting, visibility, disruption detection, and decision-making, it can also indirectly enhance resilience by improving the information available for inter-organizational coordination. IOCC translates this intelligence into joint planning, resource mobilization, synchronized action, and operational adaptation, thereby strengthening HSCR.

Accordingly, this study extends DCT to humanitarian supply chains by demonstrating how digital sensing capabilities and inter-organizational coordination capabilities complement each other in building resilience. Applied to humanitarian organizations in Uganda, DCT explains the direct relationships among BDAC, IOCC, and HSCR and, importantly, the mediating role of IOCC in translating analytics capabilities into resilient humanitarian supply chain outcomes.

Hypotheses Development

Big Data Analytics Capabilities and Humanitarian Supply Chain Resilience

The role of Big Data Analytics Capabilities (BDAC) in strengthening Humanitarian Supply Chain Resilience (HSCR) has gained increasing attention as humanitarian operations face growing uncertainty, rapidly changing demand, and resource constraints. BDAC refers to an organization's capacity to integrate data, technological, human, and managerial resources to transform large and diverse datasets into actionable insights. In humanitarian operations, BDAC can improve situational awareness, forecasting, disruption detection, resource allocation, operational visibility, and timely decision-making.

Existing research supports the resilience-enhancing role of BDAC. Earlier studies demonstrate that big data analytics improves visibility, coordination, and responsiveness within humanitarian supply chains (Dubey et al., 2018). More recent evidence shows that BDAC contributes to proactive and reactive supply chain resilience when combined with complementary organizational capabilities (Jiang et al., 2024; Lee et al., 2024). Kong and Feng (2025) further demonstrate that technical, managerial, and data-driven dimensions of BDAC contribute to resilience, while humanitarian-specific evidence identifies BDAC as an important antecedent of HSCR (Tetteh

et al., 2024). Collectively, these studies suggest that analytics capabilities enable organizations to anticipate disruptions and make more informed and adaptive decisions.

This relationship is supported by Dynamic Capability Theory (DCT), which proposes that organizations operating in uncertain environments require capabilities to sense changes, seize appropriate responses, and reconfigure resources accordingly (Teece et al., 1997; Eisenhardt & Martin, 2000; Teece, 2007). Within this framework, BDAC primarily represents a sensing capability, enabling humanitarian organizations to identify emerging threats, forecast beneficiary requirements, detect supply chain constraints, and generate timely operational intelligence. BDAC should therefore be viewed not merely as technological infrastructure but as an organizational capability integrating technology, data, analytical expertise, and managerial competencies.

This capability is particularly important in humanitarian supply chains characterized by uncertain demand, urgency, infrastructure disruptions, resource scarcity, and multiple interdependent actors. Strong BDAC can reduce information uncertainty and enable timely adjustments to procurement, inventory, transportation, and distribution activities. However, much of the existing evidence originates from commercial and manufacturing supply chains, while empirical research within resource-constrained humanitarian environments, particularly in Sub-Saharan Africa, remains comparatively limited. This provides an important contextual basis for examining whether BDAC strengthens HSCR among humanitarian organizations operating in Uganda.

Accordingly, this study argues that humanitarian organizations with stronger BDAC are better positioned to anticipate disruptions, improve operational visibility, allocate resources effectively, and adapt their operations to changing humanitarian conditions. Consistent with DCT, BDAC is therefore conceptualized as a strategic sensing capability that contributes to HSCR. Hence,
H1: Big Data Analytics Capabilities have a positive and significant effect on Humanitarian Supply Chain Resilience.

Big data analytics capabilities and Inter-organizational coordination capability
Effective coordination across organizational boundaries is essential in humanitarian operations involving multiple interdependent actors. Such coordination depends substantially on the availability and timely exchange of reliable information. Big Data Analytics Capabilities (BDAC) can strengthen this informational foundation by enabling humanitarian organizations to acquire, integrate, and analyze diverse data, thereby improving shared situational awareness, reducing information asymmetries, and supporting coordinated decision-making.

Previous research supports the contribution of BDAC to inter-organizational relationships. Dubey et al. (2019) demonstrate that big data analytics contributes to collaborative performance in humanitarian supply chains, while Tetteh et al. (2024) highlight the importance of BDAC alongside information alignment and collaboration. Similarly, Jiang et al. (2024) demonstrate that BDAC complements supply chain integration in strengthening resilience. Collectively, these findings suggest that analytics capabilities become particularly valuable when they facilitate information sharing and alignment of activities across organizational boundaries.

Operationally, BDAC can strengthen Inter-Organizational Coordination Capabilities (IOCC) by providing timely information on beneficiary needs, resource availability, supply shortages, and logistical constraints. This improves information visibility and quality, facilitates joint planning, and enables humanitarian actors to synchronize decisions and coordinate resources. Thus, BDAC provides the informational foundation necessary to transform fragmented organizational information into coordinated collective action.

This relationship is further explained by Dynamic Capability Theory (DCT). BDAC primarily represents a sensing capability, enabling humanitarian organizations to identify and interpret emerging disruptions and humanitarian requirements (Teece et al., 1997; Eisenhardt & Martin, 2000; Teece, 2007). However, sensing generates greater value when the resulting intelligence supports coordinated action. IOCC facilitates this transition by enabling organizations to share information, jointly plan responses, mobilize complementary resources, and synchronize activities, thereby supporting seizing and reconfiguration. Hence, BDAC and IOCC represent complementary capabilities through which analytical intelligence is transformed into coordinated humanitarian action.

Despite growing evidence linking analytics with collaboration, information alignment, and supply chain integration (Dubey et al., 2019; Tetteh et al., 2024; Jiang et al., 2024), the direct relationship between BDAC and IOCC remains comparatively underexplored in resource-constrained humanitarian settings. Accordingly, this study argues that stronger BDAC enables humanitarian organizations to reduce information asymmetries, establish shared situational awareness, and strengthen joint planning and coordinated decision-making. Therefore:
H2: Big Data Analytics Capabilities have a positive and significant effect on Inter-Organizational Coordination Capabilities.

Inter-organizational coordination capability and Humanitarian supply chain resilience
Effective Inter-Organizational Coordination Capabilities (IOCC) are critical to Humanitarian Supply Chain Resilience (HSCR) because humanitarian operations involve multiple autonomous but interdependent actors that rely on one another for information, resources, expertise, and logistical capacity. IOCC reflects an organization's capacity to exchange timely information, undertake joint planning, synchronize decisions, clarify responsibilities, and coordinate resources and activities across organizational boundaries. Strong coordination can reduce duplication, improve resource utilization, and facilitate timely and coherent responses to humanitarian disruptions.

Existing research supports the importance of inter-organizational capabilities in strengthening resilience. Scholten et al. (2014) demonstrate that collaboration and supply chain relationships enhance organizations' capacity to prepare for and respond to disruptions. More recent humanitarian research similarly identifies collaboration, information alignment, and organizational flexibility as important contributors to HSCR (Tetteh et al., 2024). Jiang et al. (2024) further demonstrate that supply chain integration contributes to proactive and reactive resilience, reinforcing the importance of aligning information, resources, and activities across organizational boundaries.

The relationship is further explained by Dynamic Capability Theory (DCT). DCT proposes that organizations operating in uncertain environments must sense environmental changes, seize appropriate responses, and reconfigure resources as conditions evolve (Teece et al., 1997; Eisenhardt & Martin, 2000; Teece, 2007). Within this framework, IOCC primarily facilitates seizing and reconfiguration. It enables humanitarian organizations to translate information about disruptions into joint decisions, mobilize complementary resources, synchronize activities, and adjust inter-organizational arrangements as conditions change.

IOCC can therefore strengthen HSCR both proactively and reactively. Proactively, coordination facilitates joint preparedness, contingency planning, risk-information sharing, and role clarification. Reactively, it enables rapid information exchange, collective decision-making, resource mobilization, adaptation, and recovery. This capability is particularly important in resource-constrained environments, where individual humanitarian organizations can overcome resource limitations by accessing and combining complementary capabilities across the humanitarian network.

Despite growing research on collaboration, integration, and information sharing, IOCC as a distinct organizational capability and its direct relationship with HSCR remain comparatively underexplored, particularly in resource-constrained Sub-Saharan African humanitarian settings. Accordingly, this study argues that stronger IOCC enables humanitarian organizations to coordinate information and resources, adapt operations, and respond collectively to disruptions, thereby strengthening HSCR. Hence:
H3: Inter-Organizational Coordination Capabilities have a positive and significant effect on Humanitarian Supply Chain Resilience.

To examine the mediating role of inter-organizational coordination capability in the relationship between big data analytics capabilities and humanitarian supply chain resilience
Humanitarian supply chains comprise multiple autonomous but interdependent actors whose effectiveness depends on transforming information and resources into coordinated action. As established in the preceding hypotheses, BDAC can strengthen HSCR through improved situational awareness, forecasting, visibility, and decision-making, while IOCC enhances HSCR through information sharing, joint planning, resource

mobilization, and synchronized action. These relationships provide the basis for examining IOCC as a mechanism through which BDAC translates into HSCR.

Although BDAC enables humanitarian organizations to generate timely analytical intelligence, information alone may not produce resilient outcomes. Intelligence concerning emerging risks, beneficiary requirements, supply shortages, or logistical disruptions must be shared and translated into collective decisions and coordinated responses. Existing studies increasingly demonstrate that the resilience benefits of BDAC depend on complementary organizational capabilities, including supply chain integration, flexibility, collaboration, information alignment, and organizational ambidexterity (Jiang et al., 2024; Lee et al., 2024; Tetteh et al., 2024; Kong & Feng, 2025). Humanitarian research similarly demonstrates that analytics can strengthen collaborative performance by improving the informational foundations of inter-organizational relationships (Dubey et al., 2019).

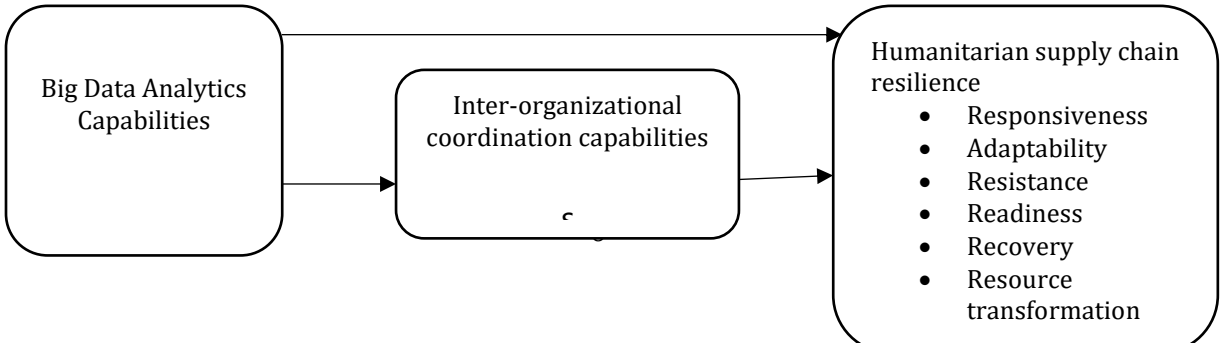
IOCC therefore provides a plausible mechanism through which BDAC contributes to HSCR. BDAC can improve the availability, timeliness, and quality of information shared among humanitarian partners, thereby reducing information asymmetries and facilitating shared situational awareness, joint planning, and synchronized decision-making. IOCC subsequently enables humanitarian organizations to mobilize complementary resources, coordinate logistics activities, and adapt operational arrangements in response to changing humanitarian conditions.

This mediating mechanism is supported by Dynamic Capability Theory (DCT). BDAC primarily represents a sensing capability, enabling humanitarian organizations to detect and interpret disruptions, while IOCC facilitates seizing and reconfiguration by translating analytics-generated intelligence into coordinated decisions, resource mobilization, and adaptive action (Teece et al., 1997; Eisenhardt & Martin, 2000; Teece, 2007). Thus, the proposed mechanism is:
BDAC (sensing) → analytical intelligence → IOCC (seizing and reconfiguration) → coordinated humanitarian action → HSCR.

Importantly, IOCC is not proposed as the only pathway through which BDAC influences HSCR. BDAC can directly enhance resilience through improved forecasting, visibility, disruption detection, and decision quality, while also exerting an indirect effect through IOCC. This theoretical reasoning therefore supports partial mediation whereby analytics-generated intelligence strengthens coordination, which subsequently contributes to resilience.

Despite growing evidence on complementary capabilities linking BDAC to resilience, the specific mediating role of IOCC remains comparatively underexplored, particularly within resource-constrained humanitarian environments in Sub-Saharan Africa. Examining this mechanism therefore extends existing research by explaining how BDAC-generated intelligence is transformed into coordinated action and ultimately HSCR. Accordingly:
H4: Inter-Organizational Coordination Capabilities mediate the relationship between Big Data Analytics Capabilities and Humanitarian Supply Chain Resilience.

Figure 1: Conceptual Framework



Source: Developed by the researcher

3. Method

Study Research Design, Population and Sample Size

This study employed a quantitative cross-sectional survey design to examine the relationships among Big Data Analytics Capabilities (BDAC), Inter-Organizational Coordination Capabilities (IOCC), and Humanitarian Supply Chain Resilience (HSCR). The design was appropriate for collecting data at a single point in time and for statistically testing hypothesized relationships among the study variables (Cooper & Schindler, 2014; Sekaran & Bougie, 2016). The humanitarian organization was the unit of analysis, while knowledgeable employees involved in supply chain and humanitarian operations constituted the unit of inquiry.

A sample of 88 humanitarian organizations operating in Uganda was selected from the study population. Within each organization, knowledgeable informants, including Supply Chain Coordinators, Logistics Coordinators, Operations Managers, Field Officers, and personnel involved in relief logistics, were purposively selected because of their familiarity with the organization's supply chain activities. A total of 275 questionnaires were distributed, of which 253 were returned, representing a response rate of 92.0%. Participation was voluntary, and consent was obtained from both participating organizations and individual respondents.

Before analysis, questionnaires were screened for completeness, consistency, and missing data. Since multiple informants provided information about the same organization, responses were aggregated to the organizational level after establishing sufficient within-organization agreement. Aggregation was assessed using ICC(1), ICC(2), and within-group agreement (rwg) (Bliese, 2000). The results—ICC(1) = 0.67, ICC(2) = 0.91, and rwg = 0.93—demonstrated strong within-organization agreement and supported aggregation. Responses from informants within each organization were therefore averaged to generate organization-level composite scores, resulting in a final analytical sample of 88 humanitarian
and relief logistics.

Sample characteristics results

Table 1 presents the characteristics of the participating humanitarian organizations (HOs) and respondents. Most participating organizations were international non-governmental organizations (INGOs) with foreign headquarters, followed by locally based and community-based NGOs. The majority of organizations (64.8%) had operated for more than 20 years, indicating substantial organizational experience in humanitarian operations. Most organizations also employed more than 200 staff, reflecting relatively large operational structures.

The major areas of humanitarian intervention were Nutrition and Health, Core Relief, and Education Services, demonstrating the diverse nature of services provided by the participating organizations. Regarding respondent characteristics, the majority were male and were predominantly aged 36–40 years, followed by those aged 31–35 years. Most respondents served as supply chain/procurement officers and logistics coordinators and held bachelor's or postgraduate qualifications. Furthermore, most had 6–10 years of experience in the humanitarian sector. Overall, the respondents occupied relevant functional positions and possessed substantial sector experience, supporting their suitability as knowledgeable informants on BDAC, inter-organizational coordination, and humanitarian supply chain resilience.

Table 1: NGO and respondents' characteristics

Organization Type	F	%	**Gender**	F	%

International HO	55	62.5	Male	128	50.6
Local HO	23	26.1	Female	125	49.4
Community-based NGO	10	11.5	Total	253	100
Total	88	100	***Age Bracket in years***	F	%
Period of Operation in years	F	%	< 30	30	11.9
< 5	3	4	31 - 35	94	37.2
5 - 10	7	7.5	36 - 40	88	34.8
11 - 15	7	7.9	41 - 45	32	12.6
16 - 20	14	15.8	Over 46	9	3.6
Over 20	57	64.8	Total	253	100
Total	88	100	*Respondents Position*	F	%
No. of employees	F	%	Logistics Coordinator	41	16.2
< 50	3	4	Project manager	42	16.6
50 - 100	7	8.3	Operations Managers	38	15
101 - 150	13	14.6	Procurement Officers	63	24.9
151 -200	18	20.2	Field Project Coordinators	69	27.3
Over 200	47	53	Total	253	100
Total	88	100	***Level of Education***	F	%
NGO Sector	F	%	Diploma level	9	3.6
Food security	11	12.5	Bachelors	157	61.1
Water, Sanitation & Hygiene	8	9.1	Postgraduate degree	81	32
Educational services	13	14.8	Doctor of Philosophy	6	2.4
Nutrition & Health	23	26.2	Total	253	100
Shelter & Infrastructure	9	10.2	***Employee Tenure in years***	F	%
Core Relief services	14	15.9	< 2	19	7.5
Protection	6	6.8	2 - 6	135	53.4
Energy & Environment	4	4.5	7 -11	70	27.7
Total	88	100	12 - 16	24	9.5
			17 and over	5	2
			Total	253	100

Sampling Design and Procedure

Organizations were selected using simple random sampling without replacement. A complete list of eligible organizations was obtained from the sampling frame, and each organization was assigned a unique identification number. The required sample was then selected randomly, with each selected organization removed from the pool before the subsequent draw to prevent duplication. This procedure ensured that each organization had an equal and independent chance of selection while preventing repeated selection.

Measurement of Variables

Study examined and contextualized within humanitarian supply chain operations. Humanitarian Supply Chain Resilience (HSCR) was conceptualized as a multidimensional construct reflecting an organization's capacity to anticipate, withstand, respond to, adapt to, and recover from disruptions while reconfiguring resources where necessary. Items assessed capabilities such as responsiveness, preparedness, adaptability, recovery, and resource reconfiguration. Representative items included: *"Our organization can quickly respond to unexpected supply disruptions"* and *"Our supply chain resumes operations rapidly after a disruption."*

Big Data Analytics Capabilities (BDAC) were measured using items adapted from established big-data analytics literature, including Dubey et al. (2019), capturing the organization's technological, analytical, and managerial capacity to acquire, process, analyze, and utilize large and diverse datasets for decision-making. Representative items included: *"We use advanced analytics tools to support relief distribution decisions"* and *"Our organization can process large volumes of real-time data to inform humanitarian operations."* Consistent with Dynamic Capability Theory, BDAC was conceptualized primarily as a sensing capability that enables humanitarian organizations to identify and interpret emerging disruptions and humanitarian requirements.

Inter-Organizational Coordination Capabilities (IOCC) were measured using items adapted from prior studies on inter-organizational integration and coordination (Srinivasan & Swink, 2018; Yu et al., 2019). The measures captured the organization's capacity for information sharing, joint planning, synchronized decision-making, and resource alignment with humanitarian partners. Representative items included: *"We regularly share critical information with our partner organizations"* and *"Our organization engages in joint planning with partners during disaster response."* Consistent with the theoretical framework, IOCC was conceptualized as facilitating seizing and reconfiguration by enabling organizations to translate information into coordinated action.

All items were measured on a six-point Likert scale, ranging from 1 = strongly disagree to 6 = strongly agree. The even-numbered scale was used to encourage respondents to indicate the direction of their assessment rather than selecting a neutral midpoint. Before the main survey, the instrument was reviewed by subject-matter experts to assess the clarity, relevance, and contextual appropriateness of the measurement items, thereby supporting face and content validity. Construct reliability and convergent and discriminant validity were subsequently assessed as part of the PLS-SEM measurement-model evaluation.

Data Collection

Primary data were collected using structured, self-administered questionnaires, which provide a standardized approach to collecting quantitative data from multiple respondents and facilitate consistency across observations (Sekaran & Bougie, 2016; Saunders et al., 2019). Before data collection, administrative clearance and permission were obtained from the participating humanitarian organizations (HOs). Appointments were subsequently arranged with designated organizational contacts to identify convenient times for questionnaire administration. Following approval, questionnaires were delivered directly to eligible respondents involved in supply chain, logistics, and humanitarian operations. Direct administration and appropriate follow-up can enhance questionnaire completion and response rates (Dillman et al., 2014). Respondents were informed about the purpose of the study, assured that participation was voluntary, and informed that their responses would be treated confidentially and anonymously in accordance with established research ethics principles (Saunders et al., 2019). This systematic procedure facilitated access to knowledgeable respondents and contributed to the high response rate achieved in the study.

Common method bias

Both ex ante procedural and post hoc statistical remedies were employed to minimize common method bias (CMB) (Podsakoff et al., 2003; Fuller et al., 2016). Procedurally, items were adapted from validated scales, simplified for clarity, respondent confidentiality was assured, and, where applicable, data were collected at different points in time. Statistically, Harman's single-factor test showed that a single factor accounted for only 24% of the total variance, below the 50% threshold, suggesting that CMB was unlikely to be a major concern (Podsakoff et al., 2003). Given the limitations of Harman's test, a latent common method factor assessment was additionally conducted (Chin et al., 2013). Collectively, these procedures indicated that CMB was unlikely to materially influence the study findings.

Data Management and Analysis

Data processing commenced with editing and screening the returned questionnaires for completeness, consistency, missing values, and accuracy. The cleaned data were coded and entered into SPSS version 26 for preliminary analysis, including respondent and organizational characteristics. Since the humanitarian organization (HO) was the unit of analysis, individual responses were subsequently aggregated to the

organizational level following confirmation of adequate within-group agreement. The aggregated data were then exported to SmartPLS 4 for Partial Least Squares Structural Equation Modeling (PLS-SEM). The analysis involved assessment of the measurement model for reliability and validity, followed by evaluation of the structural model to test the hypothesized direct and mediating relationships (Hair et al., 2022; Ringle et al., 2024).

4. Results

Measurement Validation Results

Following Hair et al. (2019, 2021), the reliability and validity of the measurement model were assessed using PLS-SEM. The study specified reflective lower-order constructs (LOCs) for Humanitarian Supply Chain Resilience (HSCR), Big Data Analytics Capabilities (BDAC), and Inter-Organizational Coordination Capabilities (IOCC). Indicator reliability was assessed using outer loadings, with indicators loading ≥ 0.708 considered satisfactory (Hair et al., 2021). Internal consistency reliability was established using Cronbach's alpha and composite reliability values exceeded 0.70 for the relevant constructs. Convergent validity was also confirmed, with average variance extracted (AVE) values exceeding the recommended threshold of 0.50, indicating that each construct explained more than half of the variance in its indicators (Hair et al., 2019, 2021). The measurement model assessment results are presented in Table 2.

Table 2: Measurement validation

Variables/constructs	Item Codes	SIL	Cronbach's alpha	rho_c	AVE
BigDataAnalytics	BDAC2	0.857	0.788	0.867	0.686
	BDAC3	0.720			
	BDAC4	0.728			
	BDAC5	0.891			
Resilience	SCRRES1	0.780	0.929	0.940	0.611
	SCRRES2	0.725			
	SCRAD1	0.770			
	SCRAD3	0.830			
	SCRAD4	0.807			
	SCRRR1	0.839			
	SCRRR2	0.731			
	SCRRR3	0.741			
	SCRRED1	0.752			
	SCRRED2	0.843			
	SCRRED4	0.792			
	SCRRED5	0.763			
	SCRREC1	0.834			
	SCRREC2	0.841			
	SCRREC4	0.738			
Inter-organizational Coordination	IOC3	0.860	0.882	0.914	0.680
	IOC4	0.812			
	IOC7	0.782			
	IOC8	0.822			
	IOC9	0.846			

Key: Standardized Item Loading (SIL); Cronbach's alpha (); Composite reliability (rho_c); Average variance extracted (AVE)

Source: PLS-SEM Measurement model

Following the assessment of reliability and convergent validity, discriminant validity was evaluated using the heterotrait-monotrait ratio (HTMT). Consistent with Hair et al. (2021), HTMT values below 0.85 indicate adequate discriminant validity, demonstrating that the constructs are empirically distinct. As shown in Table 2, all HTMT values for the lower- and higher-order constructs were below the recommended threshold, thereby establishing discriminant validity.

Table 3: Discriminant validity results

Variables	1	2	3
Big Data Analytics Capabilities (1)	0.465		
Inter-organizational Coordination capabilities (2)		0.543	
Humanitarian Supply Chain Resilience (3)			0.814

Source: PLS-SEM Measurement model

Correlation among study variables

A zero-order correlation analysis was conducted to examine the associations among Big Data Analytics Capabilities (BDAC), Inter-Organizational Coordination Capabilities (IOCC), and Humanitarian Supply Chain Resilience (HSCR). As presented in Table 4, all study variables were positively and significantly correlated ($p < .01$), providing preliminary support for the hypothesized relationships. The correlations also indicated that the variables were sufficiently associated to warrant subsequent assessment of the hypothesized relationships using PLS-SEM in SmartPLS. The structural model results are presented in the subsequent section.

Table 4: Bivariate Correlation results

Study Variables	1	3	4
Big Data Analytics (1)	1		
Inter-organizational Coordination capabilities (3)	.374**	1	
Humanitarian Supply Chain Resilience (4)	.525**	.727**	1

N=88, ** Correlation is significant at the 0.01 level (2-tailed).
Source: PLS-SEM Measurement model

Hypotheses Testing Results

The hypothesized relationships were tested using PLS-SEM in SmartPLS 4, with 5,000 bootstrap subsamples and a 95% confidence level to assess the significance of the path coefficients (Hair et al., 2022). Three direct relationships and one indirect relationship were examined. Table 4 presents the path coefficients and significance levels, while Figure 2 presents the structural model.

The results supported H1, showing that BDAC had a positive and significant effect on HSCR ($\beta = 0.326$, $p = .017$). This indicates that stronger analytics capabilities enhance humanitarian organizations' capacity to anticipate disruptions, improve situational awareness, and make timely decisions that strengthen resilience. Consistent with Dynamic Capability Theory (DCT), BDAC primarily represents a sensing capability, enabling organizations to identify and interpret emerging disruptions and humanitarian requirements (Teece, 2007).

H2 was also supported, with BDAC having a strong positive and significant effect on IOCC ($\beta = 0.591$, $p < .001$). This suggests that analytics capabilities strengthen the informational foundation for inter-organizational coordination by facilitating timely information sharing, shared situational awareness, and evidence-based joint decision-making. Thus, BDAC-generated intelligence supports the transition from sensing to coordinated action.

Similarly, H3 was supported, as IOCC had a positive and significant effect on HSCR ($\beta = 0.405$, $p < .001$). Humanitarian organizations with stronger coordination capabilities are therefore better positioned to align activities, mobilize complementary resources, adapt operations, and collectively respond to disruptions. From a DCT perspective, IOCC facilitates the seizing and reconfiguration of resources across organizational boundaries, thereby strengthening resilience.

Overall, the results support the proposed theoretical framework by demonstrating that both BDAC and IOCC significantly contribute to HSCR. More importantly, the strong BDAC → IOCC relationship, together with the significant IOCC → HSCR relationship, provides the necessary foundation for examining the hypothesized indirect effect of BDAC on HSCR through IOCC (H4).

Mediation Hypotheses Results

Following the assessment of the direct effects, the mediating role of Inter-Organizational Coordination Capabilities (IOCC) in the relationship between Big Data Analytics Capabilities (BDAC) and Humanitarian Supply Chain Resilience (HSCR) was examined following Zhao et al. (2010). The significance of the indirect effect was assessed using bootstrapping with a 95% confidence interval.

As presented in Table 5, the indirect effect of BDAC on HSCR through IOCC was positive and significant (β = 0.321, p = .002, 95% CI [0.091, 0.394]). Since the direct effect of BDAC on HSCR remained positive and significant (β = 0.326, p = .017), and both direct and indirect effects were in the same direction, the results indicate complementary partial mediation (Zhao et al., 2010). Thus, H4 was supported, demonstrating that BDAC enhances HSCR both directly and indirectly through IOCC.

From a Dynamic Capability Theory perspective, the findings demonstrate the complementarity of sensing, seizing, and reconfiguration capabilities (Teece, 2007). BDAC primarily facilitates sensing by enabling humanitarian organizations to acquire, analyze, and interpret information about emerging disruptions and humanitarian needs. IOCC subsequently facilitates seizing and reconfiguration by enabling organizations to share this intelligence, coordinate decisions, mobilize complementary resources, and adapt inter-organizational activities. Thus, IOCC provides an important mechanism through which analytics-generated intelligence is translated into coordinated action and ultimately stronger HSCR.

The findings imply that investment in BDAC alone may not fully realize its resilience potential. Humanitarian organizations should complement analytics capabilities with strong inter-organizational coordination mechanisms that facilitate information sharing, joint planning, resource mobilization, and synchronized response. This combination enables organizations to translate data-driven insights into timely and adaptive humanitarian action.

Table 5: Mediation Hypotheses Testing Results

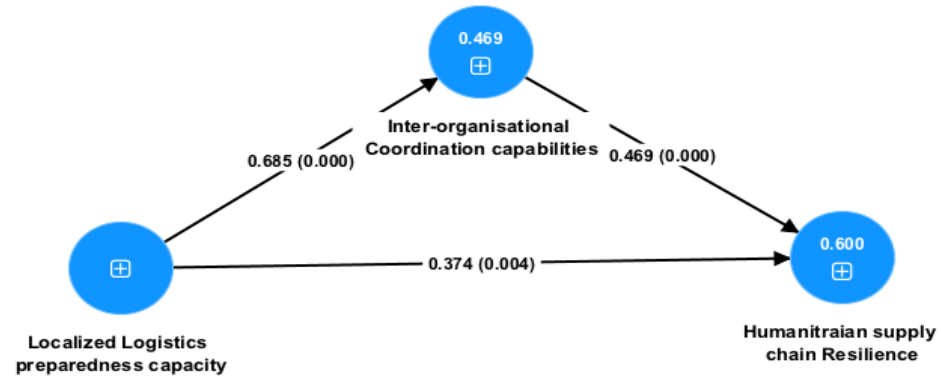
Direct Path	**β**	**SE**	**T stat**	**P values**	**2.5%**	**97.5%**	**VIF**
IOC -> HSCR	0.469	0.110	3.679	0.000	0.198	0.630	2.013
BDA -> HSCR	0.374	0.136	2.393	0.004	0.046	0.581	1.957
BDA -> IOC	0.685	0.090	6.557	0.000	0.409	0.763	2.042
Indirect effect	**β**	**SE**	**T stat**	**P values**	**2.5%**	**97.5%**	
H_4: BDA -> IOC -> HSCR	0.321	0.077	3.098	0.002	0.091	0.394	
Total effect	**β**	**SE**	**T stat**	**P values**	**2.5%**	**97.5%**	
IOC -> HSCR	0.469	0.110	3.679	0.000	0.198	0.630	
BDA -> HSCR	0.695	0.111	5.091	0.000	0.338	0.774	
BDA -> IOC	0.685	0.090	6.557	0.000	0.409	0.763	

Big Data _Analytics (BDAC), Localized Logistics Preparedness (LLP), inter-organizational coordination (IOC), and humanitarian supply chain resilience

Source: PLS-SEM Measurement model

Figure 2 illustrates the structural model used to derive the results shown in Table 5.

Figure 2: PLS-SEM for humanitarian supply chain resilience



Source: Analysis of PLS-SEM

Discussion of the Results

H_1: Big data analytics capacity has a positive effect on humanitarian supply chain resilience.

The study established a positive and significant effect of Big Data Analytics Capabilities (BDAC) on Humanitarian Supply Chain Resilience. This finding suggests that humanitarian organizations with stronger capabilities to acquire, integrate, analyze, and utilize large and diverse datasets are better positioned to anticipate disruptions, improve operational visibility, allocate resources, and respond to rapidly changing humanitarian needs. In highly uncertain humanitarian environments, timely analysis of data can improve demand forecasting, identify emerging supply chain constraints, and support faster decision-making, thereby strengthening the ability of humanitarian supply chains to withstand, adapt to, and recover from disruptions.

The finding is consistent with previous research demonstrating the resilience-enhancing role of analytics capabilities. Dubey et al. (2019) show that big data analytics can strengthen collaborative performance within humanitarian supply chains, while more recent evidence demonstrates that BDAC contributes to both proactive and reactive dimensions of supply chain resilience when combined with complementary organizational capabilities (Jiang et al., 2024). Similarly, Lee et al. (2024) establish that BDAC contributes to supply chain resilience through improved organizational capabilities, while Kong and Feng (2025) demonstrate that technical, managerial, and data-driven dimensions of BDAC strengthen resilience partly through organizational ambidexterity. Humanitarian-specific evidence also shows that BDAC, together with information alignment, collaboration, and organizational flexibility, contributes to stronger HSCR (Tetteh et al., 2024). The present findings therefore reinforce the growing evidence that analytics capabilities constitute an important foundation for resilience.

From a Dynamic Capability Theory (DCT) perspective, the finding provides empirical support for conceptualizing BDAC primarily as a sensing capability. DCT proposes that organizations operating in volatile environments must be capable of identifying and interpreting environmental changes before appropriate responses can be mobilized (Teece, 2007). In humanitarian operations, BDAC enhances this sensing process by enabling organizations to identify emerging disruptions, interpret changes in beneficiary needs, detect logistical constraints, and generate actionable intelligence. The significant BDAC–HSCR relationship therefore demonstrates how improved sensing capacity can directly strengthen an organization's ability to anticipate and respond to humanitarian supply chain disruptions.

The finding is particularly important in the Ugandan humanitarian context, where humanitarian organizations frequently operate under conditions of resource scarcity, infrastructure limitations, rapidly changing beneficiary requirements, and recurring disruptions. Under such conditions, BDAC can help organizations make better use of limited resources by improving visibility and supporting evidence-based decisions concerning procurement, inventory, transportation, and distribution. The study therefore extends existing BDAC-resilience research by providing empirical evidence from a resource-constrained humanitarian environment in Sub-Saharan Africa, a context that remains comparatively less represented in the literature.

Practically, the findings suggest that humanitarian organizations should strengthen their digital infrastructure, analytical competencies, data quality, and data-sharing systems. Investments in appropriate data platforms,

real-time information systems, analytical tools, and staff data literacy can enhance the capacity to detect disruptions and make timely decisions. However, technological investment alone may be insufficient; humanitarian organizations must also address data quality, interoperability, privacy, cybersecurity, and responsible use of sensitive beneficiary information when developing analytics capabilities.

Overall, the findings demonstrate that BDAC contributes directly to HSCR by strengthening the capacity of humanitarian organizations to sense emerging disruptions, generate timely intelligence, and make informed operational adjustments. This supports DCT while extending its application to humanitarian supply chains by demonstrating that data-driven sensing capabilities can enhance resilience even within resource-constrained environments. Importantly, however, the significant direct relationship represents only part of the mechanism identified in this study, since the findings further demonstrate that BDAC strengthens HSCR indirectly through IOCC, highlighting the complementary role of analytical and coordination capabilities.

H_2: Big data analytics capacity has a positive effect on Inter-organizational coordination capability.
The findings revealed a positive and significant relationship between BDAC and IOCC. This indicates that humanitarian organizations with stronger analytics capabilities are better positioned to share timely information, develop shared situational awareness, synchronize decisions, and coordinate resources with partners. BDAC can reduce information asymmetries and duplication while enabling humanitarian actors to align their activities based on reliable and timely information.

The findings are consistent with previous studies demonstrating that big data analytics enhances information sharing, collaboration, and coordinated decision-making within supply chain networks (Dubey et al., 2019). More recent studies similarly demonstrate the complementary relationship between BDAC and inter-organizational capabilities such as supply chain integration, information alignment, and collaboration (Jiang et al., 2024; Tetteh et al., 2024). Thus, the findings reinforce the argument that the value of BDAC extends beyond internal decision-making to strengthening relationships and coordinated activities across organizational boundaries.

From a Dynamic Capability Theory (DCT) perspective, the results demonstrate how sensing capabilities can enable seizing and reconfiguration. BDAC primarily facilitates sensing by enabling humanitarian organizations to identify and interpret emerging disruptions, while the resulting intelligence strengthens IOCC by supporting joint planning, resource mobilization, and synchronized action (Teece, 2007). This finding is particularly relevant in resource-constrained humanitarian settings, where effective information sharing and coordination can enable organizations to leverage complementary resources available across the humanitarian network.

Practically, humanitarian organizations should complement investments in analytics infrastructure with data-sharing platforms, staff data literacy, interoperability standards, and appropriate data-governance mechanisms. Overall, the findings demonstrate that BDAC provides an important informational foundation for IOCC, enabling humanitarian organizations to transform fragmented information into coordinated and adaptive humanitarian action.

H_3: Inter-organizational coordination has a positive effect on the resilience of the humanitarian supply chain.
The findings revealed a positive and significant effect of IOCC on HSCR. This indicates that humanitarian organizations with stronger coordination capabilities are better positioned to respond to disruptions, adapt their operations, and maintain continuity of humanitarian services. Effective IOCC facilitates timely information sharing, joint planning, aligned objectives, synchronized decision-making, and coordinated resource deployment, thereby reducing duplication and improving collective response to humanitarian emergencies.

The findings are consistent with previous studies demonstrating that collaboration, information sharing, and coordinated action contribute to supply chain resilience (Scholten et al., 2014). More recent humanitarian research similarly emphasizes the importance of information alignment, collaboration, and organizational flexibility in strengthening HSCR (Tetteh et al., 2024). Recent evidence on supply chain integration and resilience further supports the importance of capabilities that align information and activities across organizational boundaries (Jiang et al., 2024). The present findings therefore reinforce the view that resilience

is not generated solely within individual humanitarian organizations but also through their ability to mobilize and coordinate complementary resources across the humanitarian network.

From a Dynamic Capability Theory (DCT) perspective, the findings support the conceptualization of IOCC as facilitating seizing and reconfiguration capabilities (Teece, 2007). IOCC enables humanitarian organizations to translate information about emerging disruptions into collective decisions, mobilize resources across organizational boundaries, and reconfigure activities as conditions change. This strengthens responsiveness, adaptability, and recovery, which are central elements of HSCR.

Practically, humanitarian organizations should strengthen information-sharing mechanisms, joint contingency planning, coordination platforms, clearly defined responsibilities, resource-sharing arrangements, and inter-organizational trust. These mechanisms are particularly important in resource-constrained settings, where organizations can overcome individual resource limitations by coordinating complementary capabilities across the humanitarian network. Overall, the findings demonstrate that IOCC is a strategic capability through which humanitarian organizations transform available information and resources into coordinated action, thereby strengthening humanitarian supply chain resilience.

H_4: Inter-organization coordination capability mediates the relationship between big data analytics capacity and humanitarian supply chain resilience.
The findings confirmed that IOCC significantly mediates the relationship between BDAC and HSCR. Since the direct effect of BDAC on HSCR remained significant, the findings indicate complementary partial mediation (Zhao et al., 2010). Thus, BDAC strengthens resilience directly through improved sensing and decision-making and indirectly by enhancing inter-organizational coordination.

The findings extend previous research showing that analytics-generated information creates greater value when complemented by organizational and inter-organizational capabilities (Dubey et al., 2019; Jiang et al., 2024; Tetteh et al., 2024). Specifically, BDAC provides timely intelligence for identifying disruptions and humanitarian needs, while IOCC enables humanitarian actors to share this intelligence, jointly plan responses, mobilize complementary resources, and coordinate operational activities. The findings therefore demonstrate that information alone is insufficient; its resilience value partly depends on the capacity to translate it into coordinated action.

From a Dynamic Capability Theory (DCT) perspective, the mediation provides empirical evidence of the complementarity between sensing, seizing, and reconfiguration (Teece, 2007). BDAC primarily strengthens sensing by enabling humanitarian organizations to detect and interpret emerging disruptions, whereas IOCC facilitates seizing and reconfiguration by translating analytical intelligence into joint decisions, resource mobilization, and adaptive inter-organizational responses. This provides a clearer explanation of how BDAC contributes to HSCR, rather than merely establishing that the two constructs are associated.

Practically, humanitarian organizations should therefore complement investments in analytics technologies with information-sharing platforms, joint planning mechanisms, interoperable systems, resource-sharing arrangements, and strong coordination structures. This is particularly important in resource-constrained environments, where coordination enables organizations to access and mobilize complementary resources across the humanitarian network. Overall, the findings establish IOCC as an important mechanism through which digital sensing capabilities are transformed into coordinated action and stronger humanitarian supply chain resilience.

5. Conclusion and Implications

The present study sought to elucidate the connection between big data analytics capacity and inter-organizational coordination capacities in the context of relief supply network resilience. By employing the dynamic capabilities theory, we determined the mediating role of inter-organizational coordination capability (IOCC) in the link between big data analytics capabilities (BDAC) and relief supply network resilience. The findings indicate that the capabilities for big data analytics and inter-organizational collaboration are strongly

and positively correlated with the resilience of relief supply networks. The findings indicate a significant and positive partial mediation of IOCC in the connection between BDAC and humanitarian supply chain resilience.

Implications

Theoretical implications

This study extends the application of Dynamic Capability Theory (DCT) to humanitarian supply chains by demonstrating how digital and inter-organizational capabilities jointly contribute to resilience. First, the positive relationship between Big Data Analytics Capabilities (BDAC) and Humanitarian Supply Chain Resilience (HSCR) supports the DCT proposition that organizations require strong sensing capabilities to identify, interpret, and respond to environmental changes (Teece, 2007). The findings therefore position BDAC as a digital sensing capability through which humanitarian organizations improve situational awareness and anticipate disruptions.

Second, the positive relationship between IOCC and HSCR extends DCT beyond internally held organizational capabilities by demonstrating the importance of seizing and reconfiguration across organizational boundaries. IOCC enables humanitarian organizations to translate available information into joint decisions, mobilize complementary resources, and reconfigure activities with external partners, thereby strengthening resilience. Most importantly, the significant partial mediation of IOCC in the BDAC–HSCR relationship provides a more nuanced contribution to DCT. It demonstrates that sensing capabilities do not generate resilience solely through their direct effects; their value is also realized through complementary coordination capabilities that translate analytical intelligence into collective action. The study therefore advances DCT by empirically demonstrating a capability pathway of BDAC (sensing) → IOCC (seizing and reconfiguration) → HSCR, particularly within resource-constrained humanitarian supply networks. This highlights the complementarity of digital and relational capabilities in explaining how humanitarian organizations develop resilience under conditions of uncertainty.

Practical Implications

The findings provide important practical implications for humanitarian organizations (HOs). First, the positive relationship between BDAC and HSCR suggests that HOs should strengthen their capacity to collect, integrate, analyze, and visualize data from multiple sources. Investments in real-time dashboards, mobile data applications, visualization tools, and decision-support systems can enhance situational awareness, facilitate early identification of disruptions, and support timely decision-making during humanitarian emergencies.

Second, the positive relationship between IOCC and HSCR highlights the need for HOs to strengthen coordination across organizational boundaries. Organizations should establish mechanisms for joint planning, timely information sharing, resource pooling, role clarification, and synchronized decision-making with governments, NGOs, donors, suppliers, and local partners. Human and logistical resources should also be deployed according to relevant competencies and operational requirements to enhance adaptability and response efficiency.

Finally, the partial mediating role of IOCC indicates that investment in BDAC alone is insufficient to maximize resilience. HOs should integrate digital capabilities with strong coordination mechanisms that enable analytics-generated intelligence to be translated into collective action. Accordingly, humanitarian organizations should develop interoperable data-sharing platforms, shared dashboards, joint response protocols, and coordinated resource-allocation mechanisms. Combining data-driven sensing with effective inter-organizational coordination can enable HOs to anticipate disruptions, adapt operations, recover more rapidly, and where possible, transition to an improved post-disruption state.

Study limitations and areas for further research

Despite its contributions, this study has several limitations that provide opportunities for future research. First, the model focuses on BDAC, IOCC, and HSCR without examining the antecedents that facilitate the development of these capabilities. Future studies could investigate organizational, technological, managerial, and environmental factors that enable humanitarian organizations to develop BDAC and IOCC.

Second, the study employed a cross-sectional research design, capturing organizational perceptions at a single point in time. This limits the ability to establish causal relationships and to understand how resilience capabilities evolve before, during, and after disruptions. Future research could employ longitudinal or mixed-method designs to examine changes in BDAC, IOCC, and HSCR over time and provide deeper insights into capability development and resilience dynamics.

Third, the study considered BDAC and IOCC as key predictors of HSCR, although resilience may also be influenced by other capabilities and contextual conditions. Future studies could incorporate factors such as organizational flexibility, supply chain visibility, digital maturity, leadership support, resource availability, and environmental uncertainty. Furthermore, while this study examined IOCC as a mediator, future research could investigate its moderating role or compare alternative mediating mechanisms to provide a more comprehensive understanding of how BDAC translates into resilience.

Finally, the study was limited to humanitarian organizations operating within selected humanitarian settings in Uganda, which may constrain the generalizability of the findings to other humanitarian environments and geographical contexts. Future studies should replicate the model across different countries, disaster settings, and humanitarian organizations to assess the robustness and contextual applicability of the findings.

Acknowledgement: The authors gratefully acknowledge Mbarara University of Science and Technology (MUST), through the Directorate of Research and Graduate Training (DRGT), for providing financial support for this study.

Ethical Compliance: All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

References

Aryatwijuka, W., Nyiramahoro, R., Katarangi, A., Nsambu Kijjambu, F., & Rukundo, A. (2023). Entropy in the 'entrepot': Examining the challenges of relief supply chains during COVID-19 pandemic relief item distribution operation-2020 in Uganda. *Emerald Open Research*, *4*, 36.

Bliese, P. D. (2000). Within-group agreement, non-independence, and reliability: Implications for data aggregation and analysis. In K. J. Klein & S. W. J. Kozlowski (Eds.), *Multilevel theory, research, and methods in organizations: Foundations, extensions, and new directions* (pp. 349–381).

Centre for Research on the Epidemiology of Disasters (CRED). (2024). *2023 disasters in numbers: A significant year of disaster impact*. Brussels: CRED.

Chin, W. W., Thatcher, J. B., Wright, R. T., & Steel, D. (2013). *Controlling for common method variance in PLS analysis: The measured latent marker variable approach*. MIS Quarterly, 37(3), 1–26.

Cooper, D. R., & Schindler, P. S. (2014). *Business research methods* (12th ed.). McGraw-Hill/Irwin.

Dillman, D. A., Smyth, J. D., & Christian, L. M. (2014). *Internet, phone, mail, and mixed-mode surveys: The tailored design method* (4th ed.). John Wiley & Sons.

Dubey, R., Gunasekaran, A., Childe, S. J., Bryde, D. J., Giannakis, M., & Foropon, C. (2019). *Big data analytics and artificial intelligence pathway to operational performance under the effects of entrepreneurial orientation and environmental dynamism*. International Journal of Production Economics, 226, 107599.

Dubey, R., Luo, Z., Gunasekaran, A., Akter, S., Hazen, B., & Douglas, M. (2018). Big data and predictive analytics in humanitarian supply chains: Enabling visibility and coordination in the presence of swift trust. *The International Journal of Logistics Management, 29*(2), 485–512.

European Commission. (2024). *Strategic humanitarian supply chain and logistics: Humanitarian implementation plan (HIP) 2024* (ECHO/SSC/BUD/2024/91000, Version 2). Directorate-General for European Civil Protection and Humanitarian Aid Operations (DG ECHO).

Eisenhardt, K. M., & Martin, J. A. (2000). Dynamic capabilities: What are they? *Strategic Management Journal, 21*(10–11), 1105–1121.

Fuller, C. M., Simmering, M. J., Atinc, G., Atinc, Y., & Babin, B. J. (2016). *Common methods variance detection in business research*. Journal of Business Research, 69(8), 3192–3198.

Hair, J. F., Risher, J. J., Sarstedt, M., & Ringle, C. M. (2019). When to use and how to report the results of PLS-SEM. *European Business Review, 31*(1), 2–24.

Hair, J. F., Hult, G. T. M., Ringle, C. M., Sarstedt, M., Danks, N. P., & Ray, S. (2021). *Partial least squares structural equation modeling (PLS-SEM) using R: A workbook*.

Hair, J. F., Jr., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2022). *A primer on partial least squares structural equation modeling (PLS-SEM)* (3rd ed.). SAGE Publications.

Iftikhar, R., & Khan, M. S. (2022). Social media big data analytics for demand forecasting: development and case implementation of an innovative framework. In Research Anthology on Big Data Analytics, Architecture, and Applications (pp. 902-920). IGI Global.

Iftikhar, A., Purvis, L., & Giannoccaro, I. (2021). A meta-analytical review of antecedents and outcomes of firm resilience. *Journal of Business Research, 135*, 408–425.

Jiang, Y., Feng, T., & Huang, Y. (2024). Antecedent configurations toward supply chain resilience: The joint impact of supply chain integration and big data analytics capability. *Journal of Operations Management, 70*(2), 257–284.

Kasese District Local Government – Disaster Technical Report, May 2020.

Kong, T., & Feng, T. (2025). Enhancing supply chain resilience: The role of big data analytics capability and organizational ambidexterity. *Industrial Management & Data Systems, 125*(7), 2348–2370.

Lee, V. H., Foo, P.-Y., Cham, T.-H., Hew, T.-S., Tan, G. W.-H., & Ooi, K.-B. (2024). Big data analytics capability in building supply chain resilience: The moderating effect of innovation-focused complementary assets. *Industrial Management & Data Systems, 124*(3), 1203–1233.

Pereira, C. R., Christopher, M., & da Silva, A. L. (2019). *Achieving supply chain resilience: The role of procurement*. Supply Chain Management: An International Journal, 24(1), 122–134. https://doi.org/10.1108/SCM-09-2017-0300

Podsakoff, P. M., MacKenzie, S. B., Lee, J.-Y., & Podsakoff, N. P. (2003). *Common method biases in behavioral research: A critical review of the literature and recommended remedies*. *Journal of Applied Psychology, 88*(5), 879–903.

Ringle, C. M., Wende, S., & Becker, J.-M. (2024). *SmartPLS 4* (Version 4.0) [Computer software Ringle, Christian M., Wende, Sven, & Becker, Jan-Michael. (2024). SmartPLS 4. Bönningstedt: SmartPLS.

Saunders, M. N. K., Lewis, P., & Thornhill, A. (2019). *Research methods for business students* (8th ed.). Pearson.

Scholten, K., Sharkey Scott, P., & Fynes, B. (2014). Mitigation processes–antecedents for building supply chain resilience. *Supply Chain Management: An International Journal*, *19*(2), 211-228.

Sekaran, U., & Bougie, R. (2016). *Research methods for business: A skill-building approach* (7th ed.). Wiley.

Srinivasan, R., & Swink, M. (2018). An investigation of visibility and flexibility as complements to supply chain analytics: an organizational information processing theory perspective. *Production and Operations Management*, *27*(10), 1849-1867.

Teece, D. J., Pisano, G., & Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic Management Journal, 18*(7), 509–533.

Teece, D. J. (2007). Explicating dynamic capabilities: The nature and micro foundations of (sustainable) enterprise performance. *Strategic Management Journal, 28*(13), 1319–1350.

Tetteh, F. K., Owusu Kwateng, K., & Tani, W. (2024). Humanitarian supply chain resilience: Does organizational flexibility matter? *Benchmarking: An International Journal, 32*(8), 2833–2860.

United Nations High Commissioner for Refugees. (2025). *Uganda*. UNHCR. UNHCR Uganda country page

Yu, W., Chavez, R., Jacobs, M. A., & Feng, M. (2019). *Data-driven supply chain capabilities and performance: A resource-based view*. Transportation Research Part E: Logistics and Transportation Review, 114, 371–385.

Zhao, X., Lynch, J. G., Jr., & Chen, Q. (2010). Reconsidering Baron and Kenny: Myths and truths about mediation analysis. *Journal of Consumer Research, 37*(2), 197–206.