

Next generation humanitarian supply chain: the emergence of orchestration and choreography

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Abstract

Purpose – The purpose of this study is to investigate how and when orchestration and choreography are employed to support coordination in humanitarian logistics. Focussing on the World Food Programme's (WFP) led logistics cluster (LC) and the United Nations Humanitarian Response Depot (UNHRD), the study explores how structural design factors, enabling mechanisms and motivating drivers influence orchestration and choreography during disaster response.

Design/methodology/approach – An embedded case study design, using semi-structured interviews, was undertaken with logistics experts involved in the LC and UNHRD hubs. Reflexive thematic analysis was undertaken to understand how orchestration and choreography occur in practice and what factors support their effectiveness.

Findings – The LC offers a predominantly orchestrated model, especially where urgency, scarce logistics assets and disrupted infrastructure require centralised coordination. UNHRD, on the other hand, reflects a more blended approach, combining central governance with partner autonomy and peer-to-peer collaboration. Clear structures and formal mandates, institutional leadership, expert service provision and information visibility emerge as key enablers. Participation was driven by access to funding, common services, shared goals, and mutual benefits. The findings show that choreography is more likely where stable systems, trust and partner capacity already exist.

Research limitations/implications – The research is drawn from selected WFP-related contexts, and findings may not fully capture coordination dynamics in all humanitarian settings. Future research may explore local and informal choreography, informal coordination and comparative cases across various humanitarian settings.

Practical implications – The framework helps practitioners identify when centralised orchestration is necessary and when decentralised choreography can be supported. It provides guidance for balancing central oversight, partner autonomy, shared services and local capacity in HL response operations.

Originality/value – The study generates a dynamic framework that integrates orchestration and choreography into the 3Cs model (coordination, cooperation and collaboration), expanding the theoretical lens on humanitarian logistics (HL) coordination. It expands previous conceptual models by showing how centralised and decentralised modes interact in practice during disaster response.

Keywords Humanitarian logistics, Logistics clusters, Supply chain strategy, Logistics services, Last mile delivery, Coordination, Orchestration, Choreography

Paper type Case report

1. Introduction

Unlike commercial supply chains, where inefficiencies are often reflected in financial loss, failures in humanitarian logistics (HL) and humanitarian supply chains are immediate, visible



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and often fatal. Humanitarian actors, particularly those involved in HL, are operating in an increasingly complex environment influenced by the growing frequency, intensity, and interrelated nature of disasters. Climate change is driving more severe floods, droughts, storms, heatwaves, and wildfires, while rapid urbanisation, environmental degradation and displacement are increasing communities' exposure and vulnerability (Dwirahmadi *et al.*, 2023). At the same time, many crises overlap with conflict, political instability, economic shocks, pandemics and food insecurity, creating prolonged emergencies that are difficult to predict and respond to effectively (Shareef *et al.*, 2022; Tosi and Marty, 2025; Carter and Satti, 2026). HL actors also face operational challenges, including restricted access to affected populations, damaged infrastructure, supply chain disruptions and difficulties coordinating across multiple actors (Kovács and Spens, 2009; Balcik *et al.*, 2010).

Against this backdrop, calls for new ways to tackle the growing scale of uncertainty and complexity have intensified scrutiny of traditional coordination and response models. These approaches are often criticised for being hierarchical, externally driven and detached from local communities, while proving insufficient for modern, complex disasters where an estimated 300 million people now require assistance annually (UNOCHA, 2025). Recent humanitarian reforms, particularly those linked to the 2016 World Humanitarian Summit, the Grand Bargain and the humanitarian-development-peace nexus, have allowed the sector to rethink how coordination is designed and who holds decision-making power (Fletcher, 2025; IASC, 2025; OECD-DAC, 2019). These reforms call for greater inclusion of national and local actors, stronger preparedness, increased flexible funding and coordination approaches that move beyond internationally led response models. However, the literature is slow to express how these reforms can be translated into logistics coordination models that are both locally viable and capable of delivering at scale during major emergencies. In this respect, choreography may be seen as a possible mechanism for localisation, but the literature has not yet shown clearly how it emerges within international systems or how it coexists with orchestration.

Drawing on established theories and practices from innovation and general management literature, orchestration and choreography have been used to address emerging complexities across business and supply chain settings (Dhanaraj and Parkhe, 2006; Dalmolen *et al.*, 2015; Fulconis and Paché, 2018). However, in humanitarian logistics, these concepts remain comparatively underdeveloped. Recent studies show promise in this area: Baltas *et al.* (2025) apply resource orchestration theory to humanitarian supply chain (HSC) resilience, while Queiroz *et al.* (2022) highlight the value of resource orchestration during major disruptions such as COVID-19. Ruesch *et al.* (2022) contribute by showing that cluster leadership may be more effective when the lead agency acts as a facilitator rather than acting in dual coordination and service roles (e.g. WFP).

Despite these valued contributions, current research still leaves important questions unanswered. Much of the existing work is either conceptual or treats orchestration and choreography as separate coordination modes rather than mechanisms that can interact and shift over time. Grange *et al.* (2020), for example, provide a useful conceptual account of how HSCs may shift from orchestration to choreography through major triggers such as global disasters, policy changes, and organisational restructuring. However, there remains limited empirical evidence on how these shifts occur in practice, particularly in operational structures such as the World Food Programme (WFP) led Logistic Cluster and the United Nations Humanitarian Response Depot network.

The literature helps identify what helps or hinders coordination, but often treats these factors as general coordination conditions rather than asking how they influence different coordination modes. For instance, leadership may support centralised orchestration, while trust and shared information may help enable choreography. Yet these distinctions are not always fully developed. This gap matters because HL coordination is rarely static (Noori and Weber, 2016). In large-scale emergencies, centralised orchestration can play a critical role in mobilising surge capacity and managing scarce resources, information flows, and common

services. However, as operations move toward recovery and localisation, more choreographed forms of coordination may become necessary to support local ownership, flexibility and sustained capacity (Gatignon and Wassenhove, 2010). Likewise, when orchestration or central coordination is constrained or restricted, workaround choreography may be necessary to help sustain the response (Schiffling *et al.*, 2022). The research gap is threefold. First, there is limited empirical work examining orchestration and choreography in HL coordination mechanisms. Second, existing work on how structural design factors, enablers and drivers influence these coordination modes is limited (Adsanver *et al.*, 2024). Third, the relationship between orchestration and choreography remains underdeveloped, especially in how coordination, cooperation and collaboration emerge through control and autonomy.

To develop a comprehensive understanding of these contemporary coordination concepts, a single case study of the World Food Programme (WFP) was undertaken to address this gap (see section 3.2). This study employs a deductive approach using reflexive thematic analysis (Braun and Clarke, 2006, 2021) to derive meaning from the dataset. The WFP can be considered a viable candidate for a single case study as they are the leading providers of humanitarian logistics and supply chain services and, therefore, can be considered as a “common case” (Yin, 2018) insofar as daily routines and conditions can be measured and tested against the theoretical concepts proposed. The study draws on selected elements of the 3Cs framework: design factors, drivers and enablers to analyse how orchestration and choreography operate in HL. The framework helps understand both the structural side of coordination, such as leadership, control, and logistics management, and the relational side, including how actors coordinate, cooperate and collaborate in practice. In this way, orchestration and choreography act as a managerial layer through which the 3Cs are organised, either within centralised lead-actor systems or decentralised peer-to-peer networks.

The primary objectives of this study are: 1. To identify the structural design factors that influence orchestration and choreography in the logistics cluster and UNHRD during response. 2. To examine how orchestration and choreography align, interact and are adapted within response coordination. 3. To explore what key drivers, enablers and tensions support or constrain effective orchestration and choreography. To help achieve the research objectives, the following research question (RQ) is posed: How do orchestration and choreography manifest in the coordination of humanitarian logistics within the WFP Logistics Clusters and UNHRDs, and what structural factors, drivers and enablers support their effective implementation?

1.1 Layout of paper

The paper is structured as follows: Section 2 presents an overview of the current literature on coordination, orchestration, and choreography in the humanitarian supply chain (HSC) and develops the proposed research framework. Section 3 outlines the methodological approach and analysis. In Section 4, we present the findings, followed by Section 5, which contains the discussion piece. The final section provides contributions to academic research and practice and conclusions. For this study, UNHRD and HRD are used interchangeably.

2. Literature review

2.1 Coordination in humanitarian logistics

2.1.1 Coordination in HL. Coordination in disaster management remains a persistent concern for academics and practitioners (Raju and Becker, 2013). Humanitarian coordination is defined as “the relationships and interactions among different actors operating within the relief environment” (Balcik *et al.*, 2010, p. 22). Studies examine inter- and intra-organisational coordination in disaster response and, to a lesser extent, recovery (Raju and Becker, 2013; Noori and Weber, 2016; Quarshie and Leuschner, 2020). The progression from coordination to deeper collaboration and cooperation (3Cs) is analysed in several works (Wankmüller and Reiner, 2020;

[Adsanver et al., 2024](#)), with the relief chain 3Cs framework used here as part of our conceptual framework and discussed later in this section.

2.1.2 Drivers, barriers and enablers of coordination. Studies identify key barriers to coordination, such as limited information sharing, scarce resources, mistrust and weak infrastructure, and highlight technology, training, capacity building, leadership and standard procedures as important drivers ([Kabra and Ramesh, 2015](#)). Flexibility and compromise support coordination among logistics clusters and HSC actors, enabling leaders to manage conflicting priorities and improve supply chain performance ([Mutebi et al., 2020](#); [Kwateng et al., 2022](#)). Shared technology, mutual agreements and decentralised structures can further strengthen coordination ([Choudhary et al., 2024](#)). Collaborative relationships depend on trust, leadership, resource sharing, joint procurement, service provision and shared goals, which act as core enablers of coordination ([Balcik et al., 2010](#); [Tatham and Kovács, 2010](#); [Bealt et al., 2016](#); [Moshtari, 2016](#); [Dubey et al., 2019](#)).

2.1.3 Actors and stakeholder roles in the HSC network. The HSC network comprises multiple interconnected actors and processes across regions and sectors, requiring strong coordination during disaster response ([Balcik et al., 2010](#)). Predefined roles for local actors and communities can speed up post-disaster coordination, while host governments, communities of practice (CoPs, public and private sector actors are central to preparedness ([Kovács and Spens, 2007](#); [Sahay et al., 2016](#); [Frennsson et al., 2021](#); [Ruesch et al., 2022](#); [Jensen and Hertz, 2016](#)). Roles can be structured across disaster phases to reduce confusion and friction, with umbrella organisations such as WFP and the logistics cluster often acting as coordinators ([Jensen and Hertz, 2016](#); [Akhtar et al., 2012](#)). The use of logistics service providers as central coordinators remains contested, although they are seen as needing strong coordination capabilities working with HOs ([Heaslip, 2015](#); [Cuzzolino et al., 2017](#); [Vega and Roussat, 2015](#)). Governments fund, regulate and facilitate coordination before and after events, and the role of a central actor is further explored later in the review ([Yadav and Barve, 2015](#); [Imbriale, 2025](#)).

2.2 Supply chain orchestration and choreography

2.2.1 Supply chain orchestration. Supply chain orchestration refers to the coordination and management of activities within the supply chain by a focal firm or central actor responsible for essential services and control of the network ([Zacharia et al., 2011](#)). In logistics-dominant supply chains, lead logistics providers and fourth-party logistics firms have taken on this orchestrating role, with logistics service providers (LSPs) evolving from managing individual logistics functions to providing value-added services and coordinating entire networks on behalf of their customers ([Fulconis and Paché, 2018](#)).

2.2.2 Supply chain choreography. Research on supply chain choreography is more limited and has largely emerged from studies of web services and digitally integrated business processes. Recent work describes choreography as self-organising networks in which actors make collective decisions without a central leader, interacting autonomously while sharing resources, knowledge and risks for the benefit of the whole network ([Dalmolen et al., 2015](#); [Ferraro and Iovanella, 2015](#); [Moshtari, 2016](#)). These models offer useful insights for improving the efficiency, adaptability and responsiveness of humanitarian operations ([Tabaklar et al., 2021](#)).

2.3 Orchestration in HL

2.3.1 Orchestration in HL. Drawing on work on commercial supply chains and innovation networks, orchestration in HSCs is seen as operating at global, regional, vertical and horizontal levels, with humanitarian and logistics service providers acting as central orchestrators ([Jahre et al., 2009](#); [Grange et al., 2020](#)). The roles of cluster leads and humanitarian hubs align with this function. [Grange et al. \(2020, p. 11\)](#) define orchestration in HL as the coordination of actor interactions, service integration and transaction management by a single central entity through a centralised provision model.

2.3.2 Central leadership in HL orchestration. Central leadership in HL refers to one or more organisations coordinating HL operations, often militaries, IGOs, donor bodies or government agencies (Grange *et al.*, 2020). The literature describes such actors as chain coordinators, coordinators, integrators, hubs or focal firms, reflecting their role in aligning activities and resources across the HSC (Akhtar *et al.*, 2012; Abidi *et al.*, 2015; Vega and Roussat, 2015; Cozzolino *et al.*, 2017). Central leaders may exercise contingency leadership and expert power to steer coordination, which can enable rapid decision-making but may also limit the ability of cluster members to negotiate or challenge decisions (Siawsh *et al.*, 2021; Masoomi *et al.*, 2023). Decision-making in disaster response is commonly centralised, with proven dependability of organisations such as the WFP enabling quick coordinated action and equitable distribution of resources based on priority (Akhtar *et al.*, 2012).

2.3.3 Managing HL orchestration. Focal actors orchestrate logistics by delivering services and leveraging member resources, while maintaining stability and information flows in the network (Dhanaraj and Parkhe, 2006; Vega and Roussat, 2015; Moshtari, 2016; Baltas *et al.*, 2025; Queiroz *et al.*, 2022). At the horizontal level, HL activities are managed by supply chain managers, LSPs, humanitarian service providers (HSPs) and cluster leads; at the strategic level, umbrella organisations such as the United Nations Office for the Coordination of Humanitarian Affairs (UNOCHA), International Non-Governmental Organisations (INGOs), WFP and government agencies coordinate global logistics, policies, communication, procurement, partnerships and finance (Bealt *et al.*, 2016; Cozzolino *et al.*, 2017; Jahre, 2017). Clusters attract members through shared resources, funding opportunities, economies of scale and reduced duplication, yet rigid orchestration and donor-driven collaboration can delay decisions, create mistrust, encourage earmarked funding and strict reporting, and introduce coercive controls that discourage cooperation and local actor involvement, adding hierarchical layers and complexity to the HSC (Clarke and Campbell, 2018; Mutebi *et al.*, 2020; Siawsh *et al.*, 2021).

2.4 Choreography in HL

2.4.1 Choreography in HL. In contrast to orchestration, choreography in HL refers to a collaborative and synchronised approach where activities are coordinated collectively by supply chain entities. Grange *et al.* (2020) describe choreography in the HSC as emerging within communities of practice that rely on social media, digital platforms, Internet of Things (IoT), inter- and intra-organisational collaboration and self-organising systems to manage information and activities (Cichosz *et al.*, 2020; Mutebi *et al.*, 2020). Grange *et al.* (2020, p. 13) define choreography as a decentralised approach to service provision in humanitarian logistics, based on information exchange through collaborative business processes.

2.4.2 Diffused leadership. Diffused leadership refers to a collaborative and decentralised approach to leadership, where various stakeholders make decisions in the HSC. Ferraro and Iovanella (2015, p. 6) describe diffused leadership in choreography as “leadership is diffused and the different members are organised in an absence of hierarchy”. In the context of HSCs and disaster management, this may well be the case at times. Moreover, INGOs, NGOs, and IGOs operating under uncertainty often see fluctuating centralisation depending on ground conditions, complicated by some actors’ reluctance to coordinate (Tatham *et al.*, 2017; Clarke and Campbell, 2018).

2.4.3 Managing HL choreography. In the choreography model, HL activities are managed on a peer-to-peer basis, supported by shared goals, collective action and information exchange among network members (Ferraro and Iovanella, 2015). Joint activities are self-organised and information-driven, with self-organising systems enhancing adaptability, autonomy and resilience (Grange *et al.*, 2020; Kapucu *et al.*, 2022; Mutebi *et al.*, 2020). Another example of choreography in HL is the strategic decentralisation of the International Federation of Red Cross and Red Crescent Societies (IFRC) global supply chain. IFRC’s decentralised supply chain was built around regional autonomy and local responsiveness (Jahre *et al.*, 2009; Gatignon and Wassenhove, 2010).

Examples include community-based early warning systems, volunteer mobilisation, collective management of pre-positioned stocks, joint procurement, strategic alliances and online collaboration platforms, as observed in large-scale responses such as the Haiti earthquake, where digital tools supported collective HL management (Yates and Paquette, 2011; Ergun *et al.*, 2014; Jahre, 2017). Regional preparedness initiatives, for example in the Caribbean, illustrate how collaborative pre-positioning and insurance-based funding arrangements can further support choreographed approaches (Balcik *et al.*, 2019). Choreography promotes flexibility and equitable access; however, it also risks fragmentation, poor governance, and capacity issues (Mutebi *et al.*, 2020; Kwateng *et al.*, 2022).

2.5 Summary

The HSC has evolved from coordination (limited inter-organisational links) to orchestration (central actor management) to choreography, fostering dynamic collaboration and autonomous, interdependent interactions (Grange *et al.*, 2020). Table 1, while not exhaustive, lists the characteristics and examples of orchestration and choreography in HL.

2.6 Conceptual framework

Within Adsanver *et al.* (2024) 3Cs framework, coordination aligns HL activities to optimise efficiency; cooperation involves joint efforts, shared risks, without necessarily sharing the same objectives; collaboration involves joint strategic planning, decision-making, pooled resources, and shared goals. Dimensional aspects include design factors (contextual, inter-organisational, intra-organisational), enablers and facilitators (systems, technology, hubs), and drivers and benefits (motivators supporting the 3Cs). The framework also illustrates how actors and 3C mechanisms interact with logistics functions: “procurement/supply acquisition, pre-positioning/inventory management, and transportation/last-mile distribution” (p. 386).

Orchestration and choreography build on the 3Cs by adding operational and managerial dimensions. Orchestration introduces a centralised management role that facilitates and supports partner activities, while choreography introduces a decentralised form of management based on autonomy, peer-to-peer relations and collective control. Reframing the 3Cs through these lenses shows how they translate into real logistics models: orchestration converts the 3Cs into centralised systems with clearly defined roles, resources and activities, whereas choreography expresses the 3Cs through decentralised arrangements guided by mutual agreements, digital platforms and autonomous interactions that allow flexible responses.

This study applies selected elements of the 3Cs framework, focussing on design, drivers and enablers to examine orchestration and choreography in HL. The framework covers structural control (leadership and HL management) and relational interaction (actor relationships through the 3Cs). Orchestration and choreography, therefore, provide a managerial layer that embeds the 3Cs within centralised lead-actor systems and decentralised peer-to-peer systems (see Table 1). Taking into account humanitarian supply chain characteristics, the analysis concentrates on practical systems, relationships and context (Figure 1), and does not include decision-making models or operational research tools because of its qualitative, empirical focus.

3. Research methodology

3.1 Research design

This research uses a deductive case study approach, using a theory-based conceptual framework to guide the analysis. Vega (2018) views case research as a “mainstream approach”

Table 1. Characteristics of orchestration and choreography in HL

Dimension	Orchestration	Author	Choreography	Author
Control structure	<i>Centralised:</i> A lead actor (e.g. Cluster lead) oversees logistics and manages services and resources for partners	Akhtar <i>et al.</i> (2012), Grange <i>et al.</i> (2020), Cozzolino <i>et al.</i> (2017), Vega and Roussat (2015)	<i>Decentralised:</i> NGOs/ local actors collectively manage their activities and pooled resources around shared goals	Balcik <i>et al.</i> (2010), Balcik <i>et al.</i> (2019), Wankmüller and Reiner (2020), Grange <i>et al.</i> (2020)
Coordination	<i>Top-down:</i> A central actor coordinates supplies across regions	Bealt <i>et al.</i> (2016), Ruesch <i>et al.</i> (2022), Cozzolino <i>et al.</i> (2017), Abidi <i>et al.</i> (2015)	<i>Peer-to-peer:</i> Organisations loan and borrow stocks to address gaps	Balcik <i>et al.</i> (2019), Wankmüller and Reiner (2020), Frennesson <i>et al.</i> (2021)
Flexibility	<i>Lower:</i> Mandates and approval chains restrict rapid changes	Clarke and Campbell (2018), Mutebi <i>et al.</i> (2020), Kapucu and Garayev (2016)	<i>Higher:</i> Limited governance allows organisations to adapt to evolving situations	Mutebi <i>et al.</i> (2020), Kabra and Ramesh (2015), Balcik <i>et al.</i> (2019), Kwateng <i>et al.</i> (2022)
Efficiency	<i>Strategic planning:</i> Bulk procurement of supplies reduces cost but may delay deliveries	Cozzolino <i>et al.</i> (2017), Bealt <i>et al.</i> (2016), Jahre (2017), Baltas <i>et al.</i> (2025), Siawsh <i>et al.</i> (2021)	<i>Adaptability:</i> Local purchases address immediate needs but may incur higher costs per unit	Balcik <i>et al.</i> (2019), Mutebi <i>et al.</i> (2020), Kapucu and Garayev (2016)
Communication	<i>Standardised:</i> Resource use is reported to a central authority through formal systems	Cozzolino <i>et al.</i> (2017), Bealt <i>et al.</i> (2016), Jahre (2017), Baltas <i>et al.</i> (2025)	<i>Real-time and collaborative:</i> Shared platforms give live updates on needs and capacity	Ferraro and Iovanella (2015), Kapucu and Garayev (2016), Mutebi <i>et al.</i> (2020), Ergun <i>et al.</i> (2014), Kumar <i>et al.</i> (2022)
Technology Role	<i>Centralised platforms:</i> Inventory systems synchronise operations and track resource flows	Grange <i>et al.</i> (2020), Cozzolino <i>et al.</i> (2017), Vega and Roussat (2015)	<i>Distributed systems:</i> (e.g. UNHRD, mobile Apps) provide visibility and traceability while ensuring autonomy	Yates and Paquette (2011), Kapucu and Garayev (2016), Mutebi <i>et al.</i> (2020), Ergun <i>et al.</i> (2014), Kumar <i>et al.</i> (2022)
Resource Management	<i>Centralised control over key assets:</i> (e.g. transport) sets priorities and coordinates operations	Akhtar <i>et al.</i> (2012), Cozzolino <i>et al.</i> (2017), Vega and Roussat (2015)	<i>Resource autonomy:</i> Allows organisations to leverage their own assets and local knowledge for context-specific solutions	Balcik <i>et al.</i> (2010), Balcik <i>et al.</i> (2019), Wankmüller and Reiner (2020)

Source(s): Authors' own work

to understanding humanitarian logistics and supply chain management (p. 134). The following steps (Stuart *et al.*, 2002) for this methodological approach are illustrated in Figure 2.

3.2 Planning and preparation

A case study protocol (A3 in appendices) was established at the outset to ensure consistency and rigour (Yin, 2018) throughout the research process. For this study, a single embedded case study approach was used to enable an in-depth examination of the phenomenon in its real-world context (Yin, 2018). The empirical component of this study consisted of a single

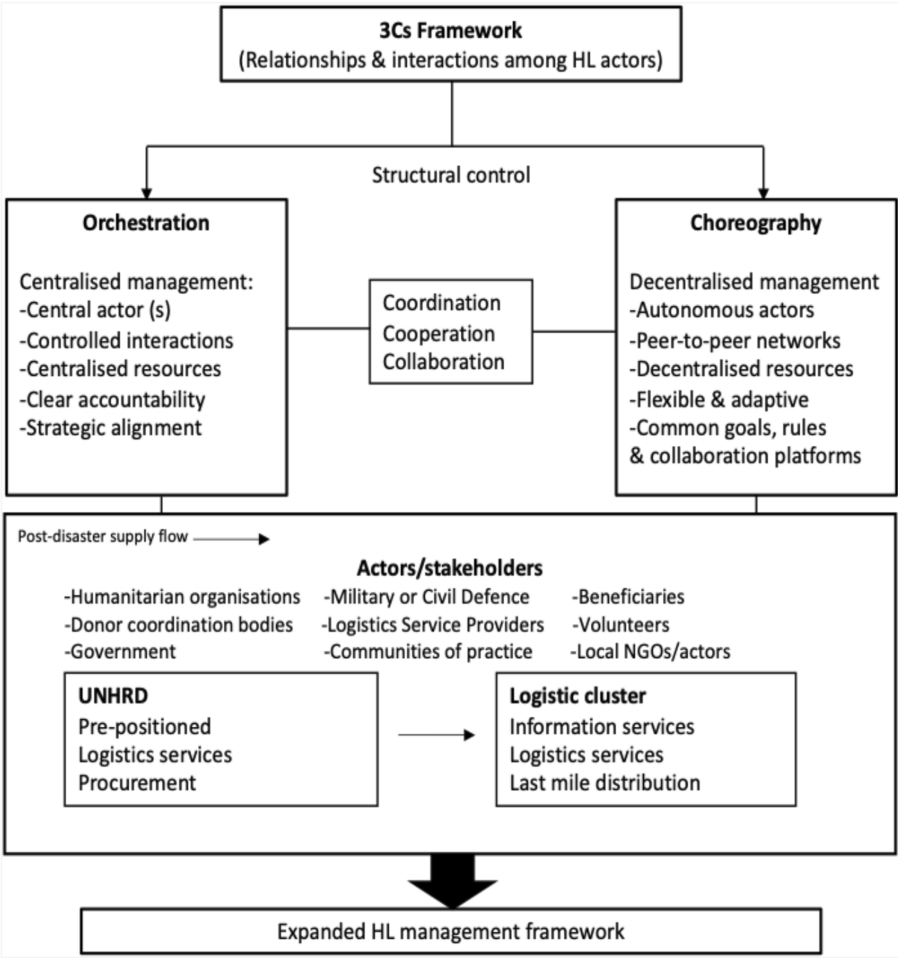


Figure 1. Conceptual framework

embedded case study of one of the largest humanitarian organisations, the World Food Programme (WFP). The embedded case study design (Figure 3) allows analysis at different organisational levels or sub-units (Yin, 2018). This study examines two levels within the WFP: the logistics cluster and the United Nations Humanitarian Response Depot (UNHRD).

3.2.1 Case selection. The case was selected based on its accessibility to data of a unique nature (Flyvbjerg, 2006) and because case study research is well-suited to examining contemporary phenomena in depth (Seuring et al., 2021). In humanitarian supply chains, no two disasters are the same and delays can cost lives, creating time pressures rarely seen in commercial logistics. The WFP is therefore a particularly suitable organisation for studying complex humanitarian supply chains, coordination, last-mile delivery and service provision. Its network of strategically located hubs and supply chain partners provides a strong setting for examining and refining theoretical concepts in HL.

3.2.2 Case description. The WFP, the world's largest humanitarian organisation, operates in more than 120 countries with over 23,000 staff, managing extensive global supply chains and logistics operations. Its fleet of ships, trucks and aircraft supports pre-positioning at HRDs,

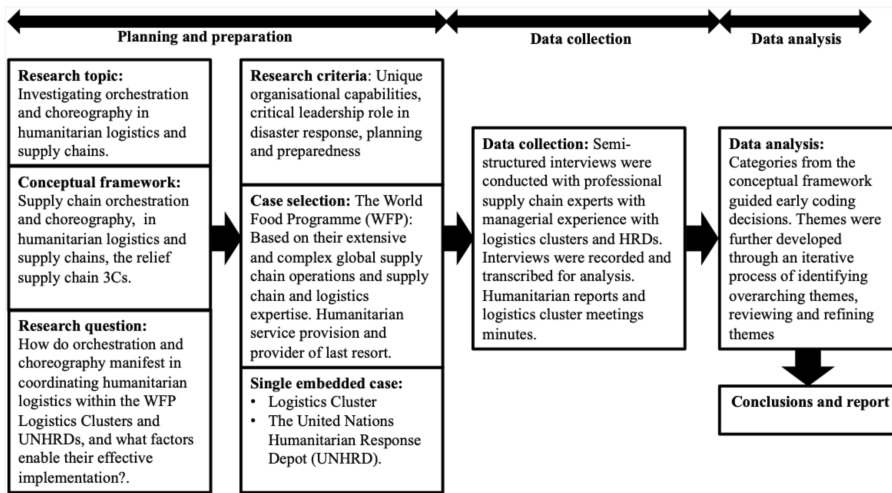


Figure 2. Methodological steps

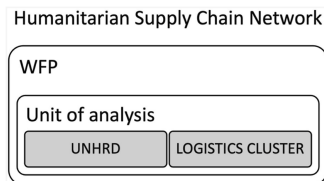


Figure 3. WFP embedded case study design

where it provides services for partners. Through the LC, WFP coordinates multiple actors by offering shared logistics services, information and supply chain expertise, and acts as a provider of last resort when critical gaps appear (WFP, 2025). Grange *et al.* (2020) argue that orchestration and choreography, concepts from commercial supply chains, parallel how the WFP manages humanitarian supply chain activities.

3.2.3 Data collection. Primary data were collected through semi-structured interviews with seven senior WFP practitioners. Interviews captured context-specific challenges, coordination practices and process details that are often undocumented or difficult to observe (Yin, 2018). They were conducted via FaceTime or Zoom, recorded, transcribed and stored securely. Each lasted 30–45 min, and interviews were completed over eight weeks. All respondents had experience of disaster preparedness, response and recovery, and had coordinated HL activities at the field level, with most also holding HQ management roles. Profiles are summarised in Table 2. Following Ruesch *et al.* (2022), additional data were gathered from humanitarian reports, policy documents and logistics cluster meetings linked to the cases. Triangulating these organisational sources strengthened reliability, validity and corroboration of findings (Yin, 2018; Vega, 2018).

3.3 Data analysis

A reflexive thematic analysis (RTA) approach (Braun and Clarke, 2006, 2021) derived meaning from the dataset. RTA, applicable across various theoretical frameworks, offers a flexible method for understanding research in social, behavioural, and applied sciences. This

Table 2. Overview of Informants

Participant	Gender	Demonym	Role and years of experience	Stakeholder type	Type of data collection
P1	Male	European	11 years LC & hub	LC coordinator Coordinator UNHRD	Interview in person
P2	Male	Australasia	11 years LC & hub	LC coordinator Coordinator UNHRD	Interview online
P3	Female	African	14 years LC & hub	LC coordinator Coordinator UNHRD Coordinator UNHCR	Interview online
P4	Male	Asian	20 years LC coordinator and hub	LC coordinator Coordinator UNHRD Coordinator Govt. advisory role	Interview online
P5	Male	European	16 years LC coordinator and hub	LC coordinator Coordinator UNHRD	Interview online
P6	Male	African	6 years LC coordinator and hub	LC coordinator Coordinator UNHRD	Interview online
P7	Male	European	10 years LC coordinator and hub	LC coordinator Coordinator UNHRD	Interview in person

Source(s): Authors' own work

study employs a deductive approach, generating themes and codes that are influenced by existing theories and concepts (Braun and Clarke, 2021). They recommend several iterative phases to guide the analysis (Figure 4). To develop converging lines of inquiry (triangulation), interviews and reports were transcribed and coded using NVivo/CAQDAS software. Familiarity with the data involved multiple readings of interview transcriptions. All content was coded, and initial themes and categories were generated. After several reviews, the main themes and categories were defined. Memos and annotations were used iteratively during the analysis process to highlight interesting patterns, identify potential biases, and capture ideas and features from the dataset (Braun and Clarke, 2021). RTA cycle and thematic mapping (A1 and A2) are outlined in the appendices.

3.4 Conceptual/theoretical framework

In the methodology, the extended 3Cs framework (Figure 1) is used as the main lens to examine coordination arrangements in HL. The design, driver and enabler dimensions guide data collection and coding by distinguishing structural control (orchestration and choreography) and relational interaction between actors across key logistics functions. This provides a consistent basis for comparing cases and interpreting how different coordination mechanisms affect HL practice and outcomes.

4. Research findings

This section addresses RO 1: *Identify the structural design factors that influence orchestration and choreography in the logistics cluster and UNHRD during response*, and RO 2: *Examine*

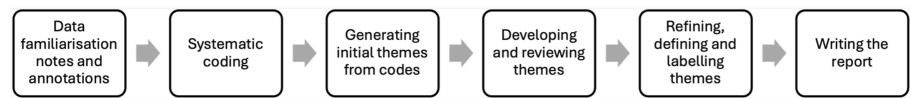


Figure 4. Phases of RTA

how orchestration and choreography align, interact and are adapted within response coordination. To answer this question, we examined the underlying structures, norms and systems that shape coordination in HL.

4.1 Design factors influencing orchestration and choreography

The following themes illustrate design factors that can influence orchestration and choreography within the LC and HRDs. They explore how these factors impact coordination and identify the relevant mechanisms. A description of these themes is provided in Table 3. A comprehensive list of all categories/themes (A4) can be found in the appendices.

4.1.1 Linking structural roles and mandates with autonomy and coordination. Initially distinct, these themes were merged, reflecting their interdependence. We believe this gives a more integrated view of how structural design and coordination dynamics interact between mechanisms.

The orchestration and choreography of HL within the LC and UNHRD are influenced by a combination of formal structures, mandates and enabling mechanisms. The foundational design factors: structural roles and mandates promote orchestration in HL, especially in the response phase of a disaster when central leadership is critical to meet overwhelming demand. These structures adhere to the principles of orchestration, whereby a designated lead actor(s) derives legitimacy and authority to coordinate logistics activities and service provision in a clearly defined way. Leadership at the global and national levels, defined through SOPs and formal agreements, ensures that priorities, resources, and decision-making are centrally directed.

Most of the time, OCHA [the UN Office for Coordination and Humanitarian Affairs] takes the lead . . . then you have the Humanitarian Coordinator . . . There are always platforms, always committees that bring agencies together under a lead agency (P3).

Despite defined central roles and governance frameworks, both mechanisms support choreography and guide how agencies interact peer-to-peer. The Cluster relies on collective decision-making in meetings and encourages partners to self-organise (e.g. sharing transport or storage), a key characteristic of choreography. However, orchestration remains the dominant mode of coordination in the LC, with agencies relying on leadership, agility, coordination, funding and operational support from a central actor to address logistics needs and gaps during a crisis: “We had a very central role in relation to the movement of relief items

Table 3. Design factors

Category	Themes	Description	Author	Participant extract
Design factors influencing orchestration and choreography	Linking Structural Roles and Mandates with Autonomy and Coordination	Defines authority and responsibility: who leads and how services are provided and balances centralisation with agency independence	Kapucu <i>et al.</i> (2022), Imbriale (2025), Akhtar <i>et al.</i> (2012), Masoomi <i>et al.</i> (2023), Sahay <i>et al.</i> (2016), Yadav and Barve (2015)	“The LC [Yemen] will continue providing Mobile Storage Units (MSU) and Temperature Controlled Units (TCU) to partners to address any storage gaps they encounter” (Logistics Cluster, 2025)

Source(s): Authors’ own work

and coordinating and distribution and storage for other humanitarian actors” (P5). Choreography in the LC is limited and emerges through informal coalitions in the absence of a central actor (e.g. agencies may collaborate and plan their activities through social media platforms and share resources). Unlike the ad hoc nature of LC orchestration, UNHRD’s orchestration operates within a stable environment, networked strategically through pre-positioned hubs. The HRD offers flexibility whereby partner agencies manage stocks on their own terms, collaborate peer-to-peer with other agencies, or leverage hub-led orchestration of their stocks, but still adhere to the rules set by UNHRD.

As a bilateral agreement without the HRD being involved, during the Ebola outbreak in West Africa, local partners adjusted stock distribution plans autonomously to ensure timely deliveries (P1).

4.2 Enablers of orchestration and choreography

The findings identify the following enablers of effective orchestration and choreography as: Empowering institutions through leadership and enabling coordination through information and digital technology systems (e.g. digital platforms and social media tools). A description of these themes is provided in Table 4.

4.2.1 Empowering institutions through leadership. In the LC, governance and leadership structures set the rules and relationships that guide how organisations work together. Disaster response requires significant control and reliance on international (WFP) operational capabilities. They influence whether coordination is more tightly orchestrated by a lead actor or more collaboratively choreographed among partners. UNOCHA (represented by the Humanitarian Coordinator (HC), Resident Coordinator (RC) and international NGOs play a crucial role in orchestrating the overall humanitarian response at the global level. They focus on coordinating and mobilising resources, setting strategic priorities, and deploying supplies

Table 4. Enablers of orchestration and choreography

Category	Themes	Description	Author	Participant extract
Enablers of orchestration and choreography	Empowering Institutions through Leadership	Leadership as a catalyst: legitimises coordination frameworks, encourages participation	Kabra and Ramesh (2015), Mutebi et al. (2020), Kwateng et al. (2022), Bealt et al. (2016), Imbriale (2025), Yadav and Barve (2015), Masoomi et al. (2023), Siawsh et al. (2021)	Partners rely on UNHRD’s systems ... instead of running their own logistics” (P6)
	Enabling Coordination through Information and Digital Technology Systems	Information enables alignment, trust, and efficiency and facilitating real-time tracking and communication	Ergun et al. (2014), Cichosz et al. (2020), Baharmand et al. (2021), Yates and Paquette (2011)	“Tracking and tracing in the last mile was a nightmare ... now with the app ... as soon as he[driver] ... scans the document, and we have a live feed saying this has now been delivered ... it also offline” (P7)

Source(s): Authors’ own work

and personnel. On the other hand, when there is capacity, governments possess significant authority and control over disaster response efforts: “This institutional backing meant the Ministry of Home Affairs officially chaired the logistics cluster, embedding it in the national response framework” (P4). This includes leading coordination, funding, and resources for affected communities. Coordination happens when priorities and resources are clearly defined by a central actor (e.g. WFP or co-led with the government). However, there are times when the government’s strategic objectives are prioritised over those of the LC. A participant described the influence of the Nepalese government thus: “Sometimes there is a, you know, some sort of instruction comes through the government. That is a little bit strategic. We cannot change that . . . we have to follow, and we have to abide by their rules” (P5). Logistics cluster leads orchestrate response efforts on behalf of the cluster members. The UNHRD manages and orchestrates strategic stocks on behalf of multiple stakeholders and facilitates collaboration. Both mechanisms rely on inter-agency goodwill and are formalised through standard operating procedures (SOPs).

WFP . . . does all the hard yards . . . there is transparency about who’s who in the zoo, what are you doing, where you’re operating (P2).

4.2.2 *Enabling coordination through information and digital technology systems.*

Information sharing and visibility support coordination by ensuring all actors have timely, transparent and accurate information on logistics across the HSC. Orchestration aligns actors and their flow of information centrally via a lead actor to facilitate visibility. Participants describe social media as a synchronised approach to coordinating the activities of different entities within the HSC. On the one hand, end-users collectively leverage online applications and disaster management tools to disseminate key information. On the other, WFP can use this information to orchestrate HL activities.

The logistics cluster will provide GPS services, they will provide information on transport . . . common logistic services, transport, road access, civil military coordination, and it’s all transparent and visible on the cloud, online (P1).

Choreography provides the space for partners to share information in a decentralised manner while working together. Digital information systems and communication tools play a critical role in disaster-orchestrated systems and the autonomous interactions of actors in choreography. In the HRD system, inter-organisational coordination and collaboration is made possible by the online platform, which clients can use to check stocks and transactions without divulging sensitive info to other partners. Information sharing enables alignment, trust, and operational efficiency, while technology tools enable real-time tracking. Digital tools facilitate real-time collaboration. Whether coordination is tightly orchestrated or more loosely choreographed, the right tools help everyone stay aligned and responsive.

We [HRD] have the system running in the wings so the user can always see who wanted to go to our website and you will see his stock reflecting whatever came in, reflecting on our system . . . technology has brought in a lot of things today by the click of a button (P5).

4.3 *Drivers of orchestration and choreography*

This section addresses RO 3: “*What key drivers, enablers and tensions support or constrain effective orchestration and choreography?*”

The following themes represent common drivers derived from the data set. A description of these themes is provided in [Table 5](#).

4.3.1 *Financial drivers of orchestration and choreography.* Common funding mechanisms drive collaboration. For example, pooled emergency funds like CERF (Central Emergency Response Fund) drive orchestration. Coordination by a central actor (s) attracts donors, and an

Table 5. Drivers of orchestration and choreography

Category	Themes	Description	Author	Participant extract
Drivers of orchestration and choreography	Financial Drivers of Orchestration and Choreography	Funding and donor incentives and cost effectiveness driving coordination	Choudhary <i>et al.</i> (2024), Bealt <i>et al.</i> (2016), Kabra and Ramesh (2015)	“Prior to that, every operation had to look for its own funding ... Now CERF ... allows them to set up [a response]” (P1)
	Localisation and Capacity Building Drivers of Choreography	Community level capability and sustainability in HL	Frennesson <i>et al.</i> (2021), Jahre <i>et al.</i> (2009), Grange <i>et al.</i> (2020), Ferraro and Iovanello (2015)	“WFP has shifted its focus ... from response to preparedness ... an international staff member hired for six months to train a local staff member to work with the local response organisations” (P1)
	Expert service provision enabling coordination	Skilled knowledge and technical competence supporting and synchronising coordination in HL	Kabra and Ramesh (2015), Vega and Roussat (2015), Cozzolino <i>et al.</i> (2017), Abidi <i>et al.</i> (2015), Akhtar <i>et al.</i> (2012), Grange <i>et al.</i> (2020)	“WFP’s transport fleets, global hubs, and trained personnel make them a critical logistics provider” (P7)
	Shared Goals and Mutual Benefits Driving Orchestration and Choreography	Shared goals and mutual benefits align stakeholders to collaborate efficiently ensuring effective coordination	Bealt <i>et al.</i> (2016), Balcik <i>et al.</i> (2010), Tatham and Kovác (2010)	“if a partner needs items it hasn’t got ... and another partner has it, we [UNHRD] come in as intermediary ... [facilitating] loans and borrowing” (P6)

Source(s): Authors’ own work

effective cluster-led operation can inspire donor confidence that aid will be delivered efficiently, leading them to contribute. This model of central funding for shared services motivates agencies to use the coordinated system rather than bear costs alone. The financial relief (not having to pay for separate fleets, etc.) is a strong driver for orchestration, especially within the LC. In addition, the recent shift to localisation has seen donors supporting localised disaster planning and preparedness. Funding mechanisms incentivise participation and make financial strategies a key driver of operational behaviour in centralised or decentralised coordination.

Vast sums were given to WFP via the logs cluster to do this [transport and storage] ... Any agency could apply ... to move materials from A to B ... to the final destination (P5).

Financial drivers support coordination through joint planning and procurement, cooperation through cost-sharing arrangements (e.g. HRDs), and collaboration through strategic donor-funded partnerships.

4.3.2 Localisation and capacity building drivers of choreography. The shift to localisation, resilience and enhancing capacity was mentioned by participants as a driver to encourage

coordination, particularly choreography. Empowering local actors to lead, design and implement coordination shifts decision-making closer to those impacted by crisis-related events. Training, mentoring and resource allocation, reduction of international actors were cited as key instruments for developing capacity. However, examples of capacity building and localisation mainly involved transition periods before the LC deactivated or developed preparedness strategies (e.g. WFP, global cluster lead, deploying logistics experts to train government and NGO staff in disaster-prone countries). Overall, the findings suggest that, during the response phase of a disaster, international actors continue to act in a leadership or co-leadership role, orchestrating HL.

In Sudan, an international mission's goal was to reduce the need for internationals ... capacity building for local staff, to save money ... and take out the reliance on international support (P7).

The locals [Bangladesh] joined together into a CO-OP and formed their own [transport] company (P5).

4.3.3 Expert service provision enabling coordination. WFP's trained teams and systems (e.g. expertise, storage and transport assets) were cited as a reason partners willingly "take the lead" from the LC and HRDs. Centralised service provision optimises supply chain efficiency. Partnering with a leading agency, logistics services, know-how, and infrastructure are enhanced. Agencies are motivated to participate when the orchestrator can do the job better or offer services they lack, especially in the LC. Larger NGOs and international aid agencies are likely to use the HRDs more often to store and ship pre-positioned stocks. Accessing the hub's facilities and staff allows organisations to focus on their core business while experts (orchestrators) handle logistics.

A lot of agencies ... the LC has the upper hand because ... who has the aircraft coming in? Who's clearing customs for you ... they're [WFP] managing that so you can get your equipment in? (P2).

The incentive for NGOs and UN agencies is it takes away the need to have their own warehouse in the region. They can store their stock [with UNHRD] ... they can have the procurement done for them. They don't need to hire specialists (P1).

4.3.4 Shared goals and mutual benefit. Orchestration supports collective response efforts. The central actor adds value by their ability to synchronise supply and demand and mobilise the resources of partner agencies to bridge gaps and avoid duplication. Agencies play their part through collaboration, cooperation, common goals, knowledge and sharing information. Participation in the LC is incentivised by centralised funding mechanisms, common logistics services, information services and supply chain expertise. On the other hand, Partner agencies of UNHRD benefit through the HRD's strategically positioned supply chain and flexibility afforded by orchestration and choreography. Agencies benefit from pre-positioned stocks, a full suite of supply chain and logistics services and lean procurement agreements.

We organised [LC meetings] and we share our minutes, we distributed minutes with action points, and based on that, we launched the logistics operations (P4).

Giving partners value and addressing their concerns so that everyone stays focused on the common objective (P4).

5. Discussion

5.1 LC and UNHRD as distinct coordination mechanisms

The LC and UNHRD provide two different but related coordination mechanisms. The LC appears to represent orchestration under pressure, activated when urgency, disrupted

infrastructure and scarce resources require a lead actor to align fragmented actors and synchronise activities around common services and priorities. This supports earlier work on focal actors and cluster coordination in HL (Akhtar *et al.*, 2012; Cozzolino *et al.*, 2017; Grange *et al.*, 2020; Adsanver *et al.*, 2024). Elements of choreography appear mainly at the field level through informal cooperation and ad hoc arrangements, but these remain secondary and are often constrained by central rules, agendas and funding structures (Clarke and Campbell, 2018; Grange *et al.*, 2020; Wankmüller and Reiner, 2020). However, even in an orchestrated system, partners retain mandates and interact through meetings, service requests and informal arrangements (Clarke and Campbell, 2018). Therefore, orchestration provides structure under pressure, but still relies on partner autonomy and cooperation.

In contrast, UNHRD appears to represent a different approach altogether. Its regional hub model creates the conditions for “controlled autonomy” where partners retain ownership of their stocks and decide when to release or distribute them, while still depending on UNHRD systems, infrastructure, freight management and service support. This creates controlled autonomy and reflects a more fluid interaction between orchestration and choreography and parallels descriptions of diffused leadership and self-organising networks in the literature (Clarke and Campbell, 2018; Balcik *et al.*, 2019; Grange *et al.*, 2020; Wankmüller and Reiner, 2020). This also extends the literature because it shows that choreography does not necessarily emerge in the absence of structure or central control, as suggested by Grange *et al.* (2020). Moreover, this suggests that, in some cases, choreography depends on structural stability to allow autonomous interaction.

The LC and UNHRD show that hybrid coordination goes beyond a single arrangement. In the LC, orchestration helps to stabilise a disrupted response environment. In UNHRD, orchestration provides a platform for partners to act with autonomy and make decisions without the same level of emergency duress. This distinction matters because it moves the discussion beyond the traditional centralised and decentralised divide and shows that the type of coordination mechanism influences the type of autonomy that is made possible.

5.2 From local to regional choreography

The literature associates choreography with communities of practice, peer-to-peer networks supported by digital platforms and autonomous actors (Ferraro and Iovanella, 2015; Grange *et al.*, 2020; Cichosz *et al.*, 2020). Yet the empirical evidence suggests that local actors may not always have the infrastructure, funding, systems, technical capacity or access to participate in such models (Mutebi *et al.*, 2020; Kwateng *et al.*, 2022). This creates an important qualification. Choreography may be possible where actors have stability, systems, resources, visibility and access to shared platforms, such as in the UNHRD. However, at the local level, weak infrastructure, limited digital capacity, limited communications capability and weak preparedness may restrict choreography, even when reforms call for greater localisation. This may explain why choreography is more visible in the regional hub network than in local disaster response settings. Moreover, this suggests that choreography does not simply emerge from decentralisation; it requires enabling infrastructure, trust, digital access and preparedness capability (Kovács and Spens, 2009; Balcik *et al.*, 2010; Carter and Satti, 2026). At the same time, when governments and cluster leads deliberately involve local NGOs and civil groups, they can create conditions for choreographed forms of coordination, echoing calls to use formal power to empower local actors rather than dominate them (Yadav and Barve, 2015). Without these conditions, decentralisation may result in exclusion or fragmentation rather than meaningful choreography.

5.3 Enablers of orchestration and choreography

5.3.1 Structural design, governance and WFP’s dual role. Structural design determines how orchestration and choreography appear in response. In the LC, formal mandates, SOPs and leadership roles reinforce a predominantly orchestrated model. This design is important during

sudden-onset response, when decision-making, prioritisation, resource allocation and mobilisation are time-sensitive and dependence on international capacity remains high (Sahay *et al.*, 2016). UNHRD, by contrast, shows how central governance can support a decentralised choice. The hub network sets the conditions for participation, while partners retain control over stock decisions and distribution. This further exemplifies how controlled autonomy enables a fluid interaction between orchestration and choreography consistent with the literature on diffused leadership and self-organising networks (Clarke and Campbell, 2018; Balcik *et al.*, 2019; Grange *et al.*, 2020; Wankmüller and Reiner, 2020).

The findings also relate to the debate on WFP's dual role as both cluster lead and logistics service provider. Ruesch *et al.* (2022) suggest that a pure facilitator role may reduce tensions in cluster coordination. This is a valid concern, particularly where service delivery and coordination roles create power asymmetry. However, the findings suggest that LC's effectiveness is partly based on its ability to provide scarce logistics assets, including multi-modal transport, storage, customs support and technical expertise (Abidi *et al.*, 2015; Bealt *et al.*, 2016; Cozzolino *et al.*, 2017; Heaslip, 2015). In this way, partners accept orchestration not only because WFP holds a formal mandate, but because it can solve immediate logistics problems at minimal cost. The issue is not whether WFP should hold power, but how that power is used: to dominate the coordination space or to create the conditions for others to coordinate more effectively.

5.3.2 Digital visibility and the technology paradox in response. Information and digital technologies reinforce this governance layer and act as cross-cutting enablers. Centralised dashboards, cluster websites and tracking tools enhance visibility and allow lead agencies to monitor flows and allocate resources, supporting orchestrated coordination (Ergun *et al.*, 2014; Grange *et al.*, 2020; Adsanver *et al.*, 2024). At the same time, mobile applications, shared online platforms and social media platforms facilitate decentralised information sharing and self-organisation among partners, in line with digital choreography models described in the supply chain and HL literature (Yates and Paquette, 2011; Dalmolen *et al.*, 2015; Cichosz *et al.*, 2020). The digital supply chain supports interconnectivity between products, services, people and processes (Kumar *et al.*, 2022).

However, the data also points to a technology paradox. These systems can improve visibility and trust, but they can also reinforce central control if information flows through platforms designed by larger HOs (Bealt *et al.*, 2016; Balcik *et al.*, 2010). This creates a technology paradox: the same systems that make coordination more efficient may also exclude actors with weaker digital capacity. For choreography to support localisation, consideration should be given to digital tools designed as shared and decoupled systems, allowing actors to work independently while still contributing to common operational goals.

5.4 Localisation and the limits of response choreography

Localisation emerged as an important driver of choreography, but it should not be treated as the opposite of orchestration. In many cases, localised response capacity begins through orchestration. International actors use funding, expertise and systems to train local responders, develop preparedness routines and support national logistics structures. Over time, this may enable more choreographed forms of response, where local actors have the confidence, tools and relationships needed to coordinate logistics activities themselves (Frennesson *et al.*, 2021; Jahre and Jensen, 2021; Carter and Satti, 2026). However, local choreography may prove difficult to achieve during response where capacity, infrastructure and digital systems are weak.

5.5 Drivers and triggers of response coordination

The drivers identified in this study help explain why response coordination moves toward orchestration or choreography. In the LC, central funding, donor confidence and access to common logistics services create strong incentives for agencies to participate in orchestrated systems. This is consistent with studies linking donor confidence, shared services and pooled

resources to effective cluster coordination (Bealt *et al.*, 2016; Moshtari, 2016; Siawsh *et al.*, 2021; Choudhary *et al.*, 2024). UNHRD’s cost-sharing arrangements, pre-positioned stocks and procurement agreements similarly encourage agencies to rely on hub-based logistics services. These resource configurations make orchestration attractive by reducing duplication and concentrating technical competence in a lead actor (Abidi *et al.*, 2015; Vega and Roussat, 2015; Baltas *et al.*, 2025).

At the same time, several conditions create space for choreography. Shared goals, stability, hub infrastructure, established relationships, shared digital visibility, trust among partners and partner ownership of resources support more autonomous interaction (Frennesson *et al.*, 2021). Sudden-onset disasters, damaged infrastructure, high donor visibility, customs problems, limited storage and scarce transport tend to trigger orchestration. In choreography, digital tools like mobile messaging apps and autonomous interactions through shared cloud and tracking systems help partners coordinate directly, which is important where formal systems are weak or access is limited (Yates and Paquette, 2011; Ergun *et al.*, 2014; Grange *et al.*, 2020). In contrast, stable environments, predictable systems, pre-positioned stocks, reliable information platforms and trusted relationships allow choreography to emerge within the response architecture. As was discussed previously, this was more evident within the UNHRD structure.

5.6 Coordinating humanitarian logistics: a dynamic framework through orchestration and choreography

The dynamic framework (Figure 5) synthesises these insights by positioning orchestration and choreography along a continuum shaped by design factors, enablers and drivers in disaster response (Table 6). It shows how orchestrated and choreographed mechanisms coexist in the LC and UNHRD, and how shifts in governance, information systems, funding and capacity can move coordination toward one end of the spectrum or the other. In doing so, it extends the original 3Cs framework by demonstrating how coordination, cooperation and collaboration

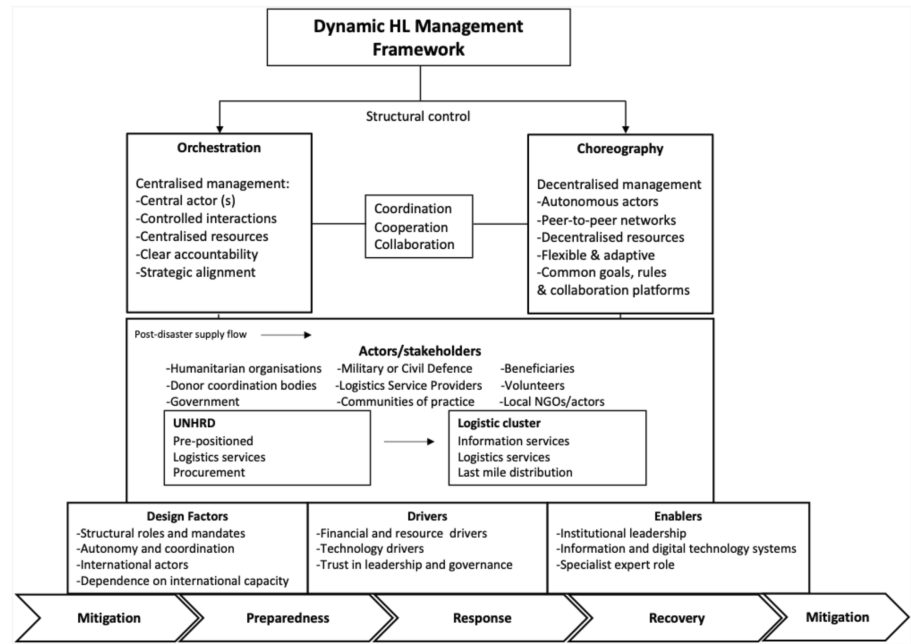


Figure 5. Dynamic HL management framework

Table 6. Integrating the 3Cs with orchestration and choreography

Factor	Coordination (3Cs)	Cooperation (3Cs)	Collaboration (3Cs)	Orchestration	Choreography
Drivers/ benefits	Efficiency/ resources/ alignment of activities	Mutual support, resource optimisation	Strategic alignment, integrated outcomes	Centralised efficiency and accountability	Decentralised flexibility and adaptability
Enablers/ facilitators	Coordination points, common services and expertise	Trust-building, resource sharing mechanisms	Shared platforms, mutual procurement strategies	Centralised control, clear governance	Digital platforms, decentralised governance
Design factors	Coordination clusters, clear task alignment	MOUs, joint resource pools	Joint strategic planning mechanisms, integrated platforms	Centralised orchestrator, clear authority structures	Decentralised network, explicit collaboration rules

Source(s): Authors' own work

are operationalised in practice through changing combinations of structure and autonomy in HL. Coordination is visible in both the LC and UNHRD through activity alignment, service requests, transport planning, information sharing and logistics management. Cooperation appears when agencies share services, use common transport or storage, and follow SOPs. Collaboration appears when actors move beyond shared services into joint planning, stock loans, mutual support and shared problem solving.

6. Contributions

6.1 Implications for humanitarian logistics practice

Distinguishing design factors, enablers and drivers helps HL actors move from ad hoc arrangements to context-specific coordination structures suited to sudden-onset or protracted emergencies (Imbriale, 2025). The framework clarifies which elements require structural development, such as mandates, infrastructure and institutional guidelines, and which depend more on relationships, such as trust, shared goals and previous cooperation. This is important for disaster response, where urgency, disrupted infrastructure, diversity of actors and limited assets often rely on orchestration. However, the findings also show that choreography can be supported where stable systems, information visibility and partner capacity exist. The framework helps agencies assess when centralised oversight may be needed and when more autonomous interaction is necessary. It also highlights the importance of orchestration, where international actors use resources, expertise and digital tools and systems to help build local routines and response capacity as part of an exit strategy to sustain ongoing operations.

6.2 Contributions for research

This study extends HL theory by reframing coordination through the combined lens of orchestration, choreography and the 3Cs framework within contemporary humanitarian supply chain practice. It introduces design, enabler and driver categories as baseline dimensions that clarify how coordination systems are structured, supported and motivated in different settings. The study also contributes empirically by comparing two WFP-related mechanisms: the LC and UNHRD. The LC demonstrates orchestration as a practical necessity during urgent response, while UNHRD illustrates how centralised infrastructure can support partner autonomy and peer-to-peer coordination. This comparison helps explain how power, mandates, expert service provision, information systems and shared goals influence coordination in practice. The study therefore moves beyond a simple centralised/decentralised distinction and provides a more grounded understanding of how orchestration

and choreography are activated, supported and constrained in HL response settings. It contributes to research on the influence of global institutions on local response capacity by showing how structural design and coordination models shape the space for local actors.

7. Conclusion

This case study explored how orchestration and choreography manifest in the coordination of humanitarian logistics, focussing on the WFP-led LC and UNHRD. To address this, we reviewed literature on coordination, orchestration, and choreography networks in HL and general management. From this, we developed a conceptual framework combining the 3Cs (coordination, cooperation, collaboration) with the characteristics of HL orchestration and choreography. Using this lens, we analysed design factors, enablers, and drivers that influence how these models operate during disaster response.

The findings show that orchestration and choreography are not mutually exclusive, but fluid and complementary modes shaped by urgency, structure, capacity, funding, information visibility and trust. The value of orchestration is demonstrated by the LC, where centralised leadership, logistics assets, and rapid mobilisation of resources are critical in disaster response. In contrast, UNHRD shows how centralised systems can enable partner autonomy and peer-to-peer collaboration through pre-positioned stocks, shared platforms and mutual service agreements.

The study contributes a dynamic framework that explains how coordination, cooperation and collaboration are managed through different combinations of control and autonomy. The research findings suggest that the future of HL coordination may not lie in replacing orchestration with choreography, but in designing orchestration so that choreography becomes possible. This requires central actors to use their power differently: not only to move goods, but to build the systems, trust, routines and digital access through which local and regional actors can coordinate more autonomously over time.

Research gaps based on our findings provide insights for practice and research. Future research could include: (1) In-depth studies focussing on local actors could clarify how choreography emerges, succeeds or fails under different enabling systems; (2) Longitudinal studies that track how coordination evolves from preparedness to recovery would help reveal role transitions and adaptability; (3) Comparative case studies or fieldwork in disaster settings across different humanitarian contexts. Several limitations are acknowledged. First, the study draws on a limited number of participants and does not represent the full diversity of humanitarian coordination settings. Second, the study focuses on international systems and actors and may under-represent the experiences and capacities of local stakeholders in choreographed systems. Third, although our conceptual model provides structure, it may not capture all relevant variables (e.g. civil-military coordination).

Supplementary material

The supplementary material for this article can be found online.

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