Does Supply Chain Integration Enhance Humanitarian Supply Chain Performance? An Empirical Investigation of Operational Outcomes

Tedarik Zinciri Entegrasyonu İnsani Yardım Tedarik Zinciri Performansını Artırır mı? Operasyonel Sonuçlara İlişkin Ampirik Bir İnceleme

Monther ALAFF[1]

Gamze KARAYAZ[2]

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ABSTRACT

Humanitarian supply chains (HSC) operate in high-uncertainty environments where speed and adaptability are critical, yet existing supply chain integration (SCI) models are primarily derived from commercial contexts. This creates a gap in understanding how integration affects performance in crisis operations. This study investigates the effect of SCI on HSC performance, focusing specifically on lead time and flexibility as two core performance dimensions. The research employs explanatory mixed-method design. Quantitative data were collected through a survey of UN supply chain staff, while qualitative insights were obtained from executive interviews. Five integration constructs: beneficiary, supplier, government, partner, and internal integration, were operationalized and analyzed statistically. The results indicate all constraints significantly influence supply chain performance, yet beneficiary integration shows the strongest effect on both lead time and flexibility, while supplier, government, and partner integrations exert more limited effects. The findings provide a context-specific theory of humanitarian SCI, demonstrating that integration strategies must be tailored to crisis conditions rather than replicated from commercial models.

Keywords: Crisis Response, Flexibility, Humanitarian Supply Chains, Lead Time, Supply Chain Integration

ÖZET

İnsani yardım tedarik zincirleri (*Humanitarian Supply Chains* – HSC), hız ve uyum sağlama kapasitesinin kritik öneme sahip olduğu yüksek belirsizlik ortamlarında faaliyet göstermektedir. Bununla birlikte, mevcut tedarik zinciri entegrasyonu (*Supply Chain Integration* – SCI) modelleri büyük ölçüde ticari bağlamlardan türetilmiştir. Bu çalışma entegrasyonun kriz operasyonlarındaki performansını nasıl etkilediğinin anlaşılmasında özellikle iki temel performans boyutu olan teslim süresi ve esneklik üzerine odaklanmaktadır. Araştırmada karma yöntem tasarımı kullanılmıştır. Nicel veriler, BM tedarik zinciri personelinden oluşan katılımcılara yönelik anket yoluyla toplanmış; nitel bilgiler ise üst düzey yönetici görüşmeleri aracılığıyla elde edilmiştir. Araştırmada yararlanıcı entegrasyonu, tedarikçi entegrasyonu, hükümet entegrasyonu, ortak entegrasyonu ve iç entegrasyon olmak üzere beş boyut operasyonelleştirilmiş ve analiz edilmiştir. Bulgular, söz konusu beş entegrasyon boyutunun tamamının tedarik zinciri performansını anlamlı biçimde etkilediğini göstermekte ancak; yararlanıcı entegrasyonu hem teslim süresi hem de esneklik üzerinde en güçlü etkiye sahipken; tedarikçi, hükümet ve ortak entegrasyonlarının etkilerinin daha sınırlı olduğu görülmüştür.

Anahtar Kelimeler: Kriz Müdahalesi, Esneklik, İnsani Yardım Tedarik Zincirleri, Teslim Süresi, Tedarik Zinciri Entegrasyonu

[1] Işık University, Institute of Graduate Studies, Monther80@gmail.com, **ORCID:** 0009-0003-5836-8836
[2] Işık University, Department of Business Administration, gamze.karayaz@isikun.edu.tr, **ORCID:** 0000-0001-6774-0933

1. Introduction

Humanitarian organizations function as the primary responders to armed conflicts, natural disasters, pandemics, and forced displacement, providing essential assistance to millions of people worldwide (Courtney, 2002; Queiroz et al., 2020). Their operations depend on humanitarian supply chains (HSCs) to ensure the rapid and reliable movement of food, medicine, shelter, and other life-saving goods to populations in urgent need (Van Looy & Shafagatova, 2016). Despite their critical importance, HSCs frequently encounter significant challenges, including failures in supply or disruption in distribution. Examples of HSC failure include the World Health Organization (WHO, 2020) and the United Nations High Commissioner for Refugees (UNHCR, 2023) which have been illustrated in recent emergencies, such as the global shortages of personal protective equipment during COVID-19 and the delayed response to the 2023 Turkey–Syria earthquake (Turkishmaritime, 2024). Although these shortcomings have direct humanitarian consequences, scholarship on improving HSC performance remains fragmented. In commercial contexts, SCI has been widely studied as a driver of efficiency, responsiveness, and customer satisfaction (Fallahpour, Yew Wong, & Rajoo, 2021; Danese, Romano, & Marco, 2013). However, humanitarian supply chains differ fundamentally from their commercial counterparts: they are multi-layered, operate under high uncertainty and resource scarcity, and prioritize speed, adaptability, and accountability over cost efficiency and profitability. Consequently, existing SCI frameworks cannot be directly applied to humanitarian contexts without empirical validation and theoretical refinement. The key gap in the current literature is the limited investigation of SCI within humanitarian operations. Despite extensive evidence from commercial and public sectors, the application of SCI in humanitarian settings remains underexplored. The distinct characteristics of humanitarian supply chains, particularly their multi-stakeholder environments and operational volatility, complicate the transfer of insights from other sectors. In particular, the roles of external stakeholders-beneficiaries, governments, and partner organizations-have received little empirical attention, even though their engagement is critical for operational outcomes. This leaves unanswered questions about how integration with these actors influences performance dimensions such as lead time and flexibility, which are essential for timely, adaptable, and effective humanitarian response. Moreover, the scarcity of large-scale, methodologically rigorous studies across multiple humanitarian regions further limits the

evidence base, leaving practitioners and scholars without robust guidance on designing context-sensitive integration strategies.

This study addresses these gaps by developing and empirically testing a comprehensive five-construct model of SCI encompassing internal, supplier, beneficiary, government, and partner integration. Drawing on survey data from 360 United Nations supply chain staff across five operational regions and qualitative insights from executive interviews, it evaluates how these forms of integration jointly and separately influence lead time and flexibility. This approach represents one of the first systematic efforts to measure and compare the effects of external stakeholder integration alongside more traditional internal and supplier integration dimensions.

The theoretical framing of the study is grounded in the Resource-Based View (RBV), Dynamic Capabilities Theory, and Contingency Theory. RBV conceptualizes SCI as a strategic capability for coordinating scarce resources, while Dynamic Capabilities Theory explains how integration allows organizations to reconfigure and adapt their supply chains under conditions of uncertainty. Contingency Theory further emphasizes that integration practices must be aligned with contextual conditions rather than applied uniformly. Together, these perspectives provide a coherent and consolidated theoretical foundation for understanding how SCI functions as both a resource and an adaptive mechanism within humanitarian operations. Stakeholder and Relational View perspectives are incorporated selectively to justify the inclusion of beneficiaries, governments, and partners as integral actors in the supply chain rather than as peripheral entities. The study advances a context-specific model of humanitarian SCI that explicitly incorporates external stakeholders and links SCI to two core performance dimensions: lead time and flexibility, thus extending the RBV and Dynamic Capabilities perspectives to high-uncertainty settings.

2. Literature Review

2.1. Humanitarian and Non-profit Organizations

To understand differences between humanitarian and commercial supply chains, it is essential to examine the organizations operating them, as the concept of “organization” must be reconceptualized to capture structural, objective, and operational differences. Humanitarian organizations, often overlapping with NGOs, are central to crisis response and social services (Courtney, 2002). Unlike commercial entities aiming at profit maximization, nonprofits pursue social missions such as poverty alleviation, health promotion, or humanitarian emergency

response (Birchall, 2002). They operate across sectors including education, healthcare, environment, and human rights, from local groups to large institutions (Kendall, 2015).

Nonprofits are mission-driven, non-profit-distributing, privately governed yet often publicly funded (Salamon & Anheier, 1996). Legal forms include charities, foundations, and social enterprises, each with distinct regulatory models (Attorney, 2021). They differ from public and private bodies in governance, funding-mainly donations, grants, and philanthropy- and accountability to diverse stakeholders (Boris & Mosher-Williams, 1998; Gronbjerg, 1994; Kearns, 1994; Hansmann, 1980; Drucker, 1990; Cornforth, 2003; Sawhill & Williamson, 2001).

Such structural differences influence supply chains: commercial ones prioritize efficiency and cost, while humanitarian supply chains focus on speed, equity, and flexibility to address unpredictable crises like Ebola, COVID-19, natural disasters, and armed conflicts (Tomasini & Van Wassenhove, 2009; Prabir et al., 2005; Wantao et al., 2013; Dong-Young, 2013; Liu et al., 2021).

2.2. Humanitarian Supply Chain Performance

Supply chain performance is broadly defined as the effective management of internal competencies to achieve competitive advantage (Tan, Kannan, & Handfield, 1998), yet its measurement remains challenging due to varying departmental priorities—sales emphasize reach, supply focuses on lead time, and production on cost and quality (Bechtel & Jayaram, 1997; Dong-Young, 2013; Rai, Patnayakuni, & Seth, 2006). Metrics typically fall into financial (e.g., ROI) and operational (e.g., lead time) categories (Carton & Hofer, 2006), with performance evaluation integrating both, including ROI, cost, lead time, fulfillment, turnover, quality, satisfaction, flexibility, and sustainability (Saleheen & Habib, 2022; Gunasekaran, Patel, & McGaughey, 2004).

Four key dimensions-time, quality, cost, and flexibility-form the basis of assessment. Time, often measured as lead time, spans procurement to delivery (Chopra & Meindl, 2010; Simchi-Levi, Kaminsky, & Simchi-Levi, 2003; Garcia et al., 2012). Quality includes reliability, durability, safety, and standards compliance (Arzu Akyuz & Erman Erkan, 2009). Cost covers procurement, production, transport, and inventory, requiring efficiency without compromising other dimensions (Karamouz, Ahmadi Kahnali, & Ghafournia, 2021). Trade-offs are common—reducing lead time may raise costs or lower quality, while excessive cost-cutting can

impair delivery and standards (Vafaei-Zadeh et al., 2020). Prioritization depends on organizational goals, such as cost in commercial firms or quality in luxury production (Lee, Seo, & Dinwoodie, 2016).

In humanitarian supply chains, time is critical as delays can cost lives, while quality extends to dignity, cultural respect, and beneficiary rights (Hashemi et al., 2022). Flexibility-the ability to adapt quickly to disruptions-is equally vital, supported by strong coordination and information sharing (Polater, 2020; Kalyar, Shafique, & Ahmad, 2020). Humanitarian and military supply chains alike emphasize time and flexibility due to mission-critical, unpredictable environments (Heaslip & Barber, 2014), yet face challenges such as unclear roles, demand uncertainty, and price volatility (Nyamu, 2012).

A review of 26 studies shows private sector focus on cost, quality, and time, while public and humanitarian sectors stress time and flexibility (Abidi, De Leeuw & Klumpp, 2014; Paciarotti, Piotrowicz & Fenton, 2021). Given their operational urgency, this study centers on time and flexibility in humanitarian contexts, leaving cost and quality for future research.

2.3. Supply Chain Integration (SCI)

Supply Chain Integration (SCI) refers to the extent of collaboration and coordination among parties within and across organizations to enable seamless, efficient operations. Initially framed in the 1980s as logistical coordination (Stevens, 1989), early definitions emphasized intra-organizational coordination to improve goods flow (Houlihan, 1987). Later, SCI evolved into a strategic partnership concept involving synchronized activities and shared risks for mutual benefit (Mentzer, 2004). Pagell (2004) distinguished operational integration—harmonizing production and logistics-from strategic integration-aligning long-term goals-while Sanders (2016) underscored informational integration enabled by digital tools such as ERP and blockchain.

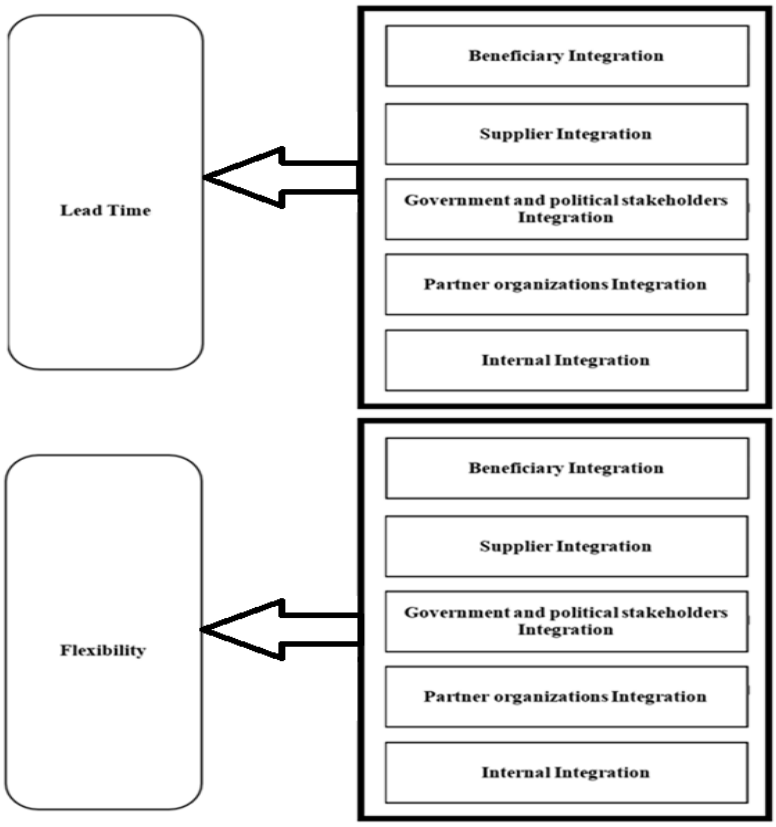
SCI may be internal, external, horizontal (same tier coordination), or vertical (linking different tiers, including governments and regulators) (Lambert, Emmelhainz, & Gardner, 1996). Evidence generally links SCI to improved performance, with high-integration firms achieving faster cycles, lower inventory costs, and higher satisfaction (Swink et al., 2007). However, results can be mixed or negative, suggesting integration effectiveness depends on context factors like complexity and volatility (Gimenez & Ventura, 2005; Wiengarten, Pagell, & Fynes, 2015).

The literature on SCI has predominantly focused on constructs such as suppliers (Zhu, Geng, & Lai, 2010; Boon-itt & Wong , 2011; Kovács, Tatham, & Larson, 2012), beneficiaries (customers) (Chen & Graddy, 2010; Van Looy & Shafagatova, 2016; Arora, Hofman, & Vatsa, 2023), and sometimes internal integration (Lee, Seo, & Dinwoodie, 2016; Van Looy & Shafagatova, 2016; Chen & Graddy, 2010), reflecting their centrality in commercial contexts, with government involvement considered mainly in public-sector settings (Nielsen, 2014; Bicking & Wimmer, 2011). This study extends these frameworks by combining all established commercial and public-sector constructs and introducing an additional dimension-partner organizations-within the humanitarian context. While SCI has been extensively examined in commercial settings, its application in humanitarian supply chains, which are marked by urgency, multi-stakeholder engagement, and operational complexity, remains underexplored.

This study develops a comprehensive framework by analyzing five key constructs of supply chain integration—Beneficiary, Supplier, Government/Political Stakeholders, Partner Organizations, and Internal Integration-each theoretically differentiated in terms of its mechanisms for enhancing humanitarian supply chain performance. Beneficiary integration improves demand anticipation and facilitates adaptive delivery processes, reducing lead times and increasing operational flexibility through the co-creation of interventions with affected populations. Supplier integration ensures timely procurement and smooth flow of goods, mitigating bottlenecks and supporting faster replenishment cycles. Integration with government and political stakeholders enables access to regulatory approvals, permits, and infrastructure, minimizing bureaucratic delays and fostering adaptive responses in volatile environments. Partner organization integration leverages shared resources, information, and operational planning to enhance flexibility and coordination across multiple actors. Finally, internal integration aligns organizational functions, ensuring efficient information flow, reducing duplication, and accelerating decision-making, thereby improving both lead time and adaptability. Collectively, these five constructs form a theoretically grounded framework aimed at enhancing the responsiveness, adaptability, and overall resilience of humanitarian supply chains. Figure 1 shows the conceptual framework of the research.

Figure 1

Conceptual Framework



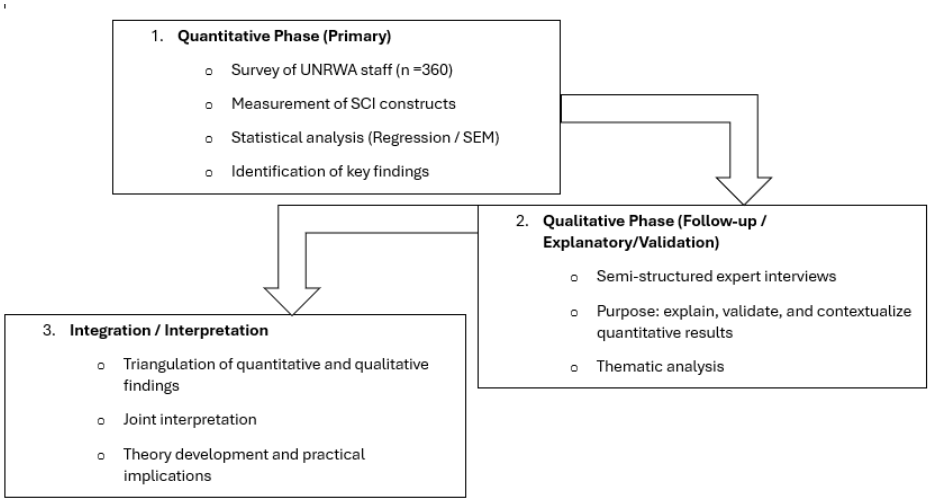
3. Methodology

3.1. Research Design

As shown, Figure 2 in this study employs a sequential explanatory mixed methods design as outlined by Creswell (2018), integrating both quantitative and qualitative approaches to comprehensively examine supply chain integration (SCI) in humanitarian contexts model.

Figure 1

Sequential Explanatory Mixed Methods Design



The design begins with a quantitative phase using a cross-sectional survey to empirically test relationships between SCI constructs and supply chain performance. This is followed by a qualitative phase comprising semi-structured interviews, intended to provide contextual depth and interpretative insights that explain, validate, and enrich the quantitative findings. Guided by a positivist-objectivist epistemological stance (Hedden, 2015), this study adopts a deductive approach to test existing theoretical propositions related to SCI, with a particular focus on the humanitarian supply chain.

3.2. Data Collection

3.2.1. Quantitative Survey

The target population includes approximately 5,000 UNRWA supply chain staff operating across five key operational fields: Gaza, West Bank, Syria, Lebanon, and Jordan. A stratified random sampling technique was employed to select a representative sample of 360 respondents. The sample size was determined using Cochran's (1977) formula (Figure 2) with finite population correction, assuming a 95% confidence level and 5% margin of error.

Figure 2

Cochran's Equation for Sample Size

$$n = \frac{Z^2 \cdot p \cdot (1-p)}{e^2 + \frac{Z^2 \cdot p \cdot (1-p)}{N}}$$

The sample was stratified by management level-comprising 10 top-level managers, 35 middle managers, and 315 operational staff-and was proportionally distributed based on staff location.

Data were collected using a 40-item questionnaire (Appendix1) adapted from validated scales (Munir et al., 2020; Tian et al., 2021) (

Table *1*). All SCI constructs were measured using 5-point Likert scales, ranging from 1 ("strongly disagree") to 5 ("strongly agree"). Performance was operationalized via two key metrics: lead time (T) and flexibility (F), measured through behaviorally anchored frequency scales.

Table 1

Operationalization of variables

Construct	**Item No**	**Item Text**
Beneficiary Integration	8	Sharing information- Developing collaboration approaches- Joint decision making- Customized services
Supplier Integration	8	Sharing information- Developing collaboration approaches- Joint decision making -System coupling with key suppliers
Government and political stakeholders Integration	7	Joint strategic planning- Joint project inception - Information sharing
Partner organizations integration	5	Joint strategic planning- information sharing
Internal Integration	8	information sharing across all departments- joint decision making- Innovativeness- cross-functional teams in process improvement
Time	1	
Flexibility	2	

The use of a limited number of items to measure the time (lead time) and flexibility constructs was a deliberate methodological choice grounded in both theoretical relevance and contextual constraints of humanitarian supply chain research. In humanitarian operations, lead time and flexibility represent narrowly defined, unidimensional performance outcomes that are conceptually well-established in the literature and frequently operationalized using parsimonious measures (Beamon, 1999; Tatham & Houghton, 2011). Given the operational environment of UNRWA, the use of concise measures was also necessary to reduce respondent burden and improve response quality among practitioners operating in high-pressure contexts.

A pilot study was conducted with 15 UNRWA staff members to evaluate the clarity, relevance, and reliability of the survey instrument. The pilot results indicated that several items contained ambiguous wording and overlapping constructs, which could potentially affect respondent interpretation and response consistency. Based on participant feedback and preliminary reliability analysis, minor modifications were made, including rewording unclear questions, simplifying technical terminology, and improving the sequencing of items to enhance logical flow. These revisions were undertaken to improve content validity, reduce respondent burden, and strengthen the reliability of the instrument prior to full-scale data collection. Then, the survey was administered online through Google Forms, following Dillman et al.'s (2008) tailored design method for improved response rates. The distribution occurred in three waves in two weeks, each accompanied by reminder prompts, culminating in an overall response rate of 57%. All collected data has been used.

3.2.2. Qualitative Interviews

To contextualize and deepen the quantitative results, 5 purposively selected executives participated in semi-structured interviews. Interviews were conducted via Zoom, lasting between 45 and 60 minutes, and were guided by an interview protocol focused on challenges related to SCI implementation in humanitarian operations. All interviews were audio-recorded with participants' informed consent.

3.3. Data Analysis

Data analysis followed a sequential explanatory mixed-methods approach designed to ensure robust measurement and strong explanatory depth. A two-stage measurement model was employed to establish construct validity and reliability prior to hypothesis testing.

In the first stage, an Exploratory Factor Analysis (EFA) was conducted in SPSS v28 using maximum likelihood extraction with oblique (Promax) rotation, given the theoretical expectation of correlated constructs. Sampling adequacy was confirmed by a Kaiser–Meyer–Olkin (KMO) value of 0.91 and a significant Bartlett's Test of Sphericity ($p < 0.001$). Five factors were retained based on eigenvalues greater than one and theoretical interpretability, jointly explaining a substantial proportion of total variance. Items with factor loadings below 0.50 or cross-loadings above 0.30 were removed. Detailed EFA results, including item-level factor loadings, extraction and rotation methods, number of factors retained, and explained variance per factor, are reported in Appendix 2.

In the second stage, Confirmatory Factor Analysis (CFA) was performed using AMOS v26 to validate the measurement model. All standardized factor loadings exceeded 0.60 and were statistically significant ($p < 0.001$). Model fit indices indicated a good fit ($\chi^2/df = 2.18$, CFI = 0.954, TLI = 0.948, RMSEA = 0.051, SRMR = 0.041). Convergent validity was supported by Average Variance Extracted (AVE) values above 0.50 and Composite Reliability (CR) values exceeding 0.80 across all constructs. Discriminant validity was assessed using the Heterotrait–Monotrait (HTMT) ratio, with all values below the recommended threshold of 0.85. Standardized CFA loadings, error variances, CR and AVE values, and the HTMT matrix are provided in Appendix 2.

Following validation of the measurement model, hypotheses were tested using multiple linear regression analysis. Two separate models were estimated, with lead time (T) and flexibility (F) as dependent variables and the five supply chain integration constructs as predictors:

$$T = a_0 + a_1B + a_2S + a_3G + a_4P + a_5I \quad (3.1)$$

$$F = a_0 + a_1B + a_2S + a_3G + a_4P + a_5I \quad (3.2)$$

where B = Beneficiary Integration, S = Supplier Integration, G = Government Integration, P = Partner Organization Integration, and I = Internal Integration. Variance Inflation Factors (VIFs) were all below 2.5, indicating no multicollinearity concerns.

The choice of regression following EFA and CFA was methodologically deliberate and grounded in considerations of sample size adequacy, model parsimony, and interpretability. While SEM offers simultaneous estimation of measurement and structural models, the study adopts a two-step analytical approach—measurement validation followed by regression-based

hypothesis testing-consistent with established practice in supply chain research. This approach enables clear comparison of construct-level effects while avoiding potential estimation instability associated with complex SEM models under sample size constraints.

Qualitative data from three purposively selected executive interviews were analyzed thematically to provide contextual explanations for the quantitative results. Interview transcripts were coded using NVivo 12 following Braun and Clarke's (2006) framework. Emerging themes were triangulated with the quantitative findings to strengthen interpretive validity. Intercoder reliability achieved a Cohen's kappa (κ) of 0.79, indicating substantial agreement.

All research procedures were conducted in accordance with the UN agency's internal ethics protocol, with informed consent obtained from all participants and strict confidentiality maintained throughout data collection and analysis.

4. Results and Discussion

4.1. Descriptive Overview

The study collected 206 valid responses (57% response rate) from UNRWA operations across five regions, with the highest participation from Gaza (64%) and the lowest from Syria (44%). Data cleaning in SPSS confirmed no missing values, and outlier analysis ensured dataset integrity. Construct scores were computed via mean aggregation of survey items, followed by reliability and validity tests.

4.2. Lead-Time Regression Model

The regression model for lead time (T) demonstrated strong explanatory power:

$$T = -0.697 + 0.343B + 0.213S + 0.190G + 0.184P + 0.260I \quad (4.1)$$

($R^2 = 0.667$, $p < 0.001$)

- Reliability & Validity: Cronbach's Alpha (0.930) and factor analysis (communalities > 0.69) confirmed internal consistency and construct validity.

- Model Fit: ANOVA revealed significant predictors ($F = 79.976$, $p = 0.000$), with B ($\beta = 0.276$, $p = 0.000$) and S ($\beta = 0.199$, $p = 0.008$) as the strongest contributors. Multicollinearity was negligible (VIFs < 3.313).

- Variance Explained: The model accounted for 66.7% of variance in lead time, with a standard error of 0.440.

4.3. Flexibility Regression Model

The flexibility (F) model also achieved statistical significance:

$$F= 0.034+0.316B+0.155G+0.351I+0.164P+0.001S \quad (4.2)$$

($R^2 = 0.552$, $p<0.001$)

- Reliability & Validity: High Cronbach's Alpha (0.923) and communalities (> 0.66) validated the constructs.

- Key Predictors: I ($\beta = 0.295$, $p = 0.000$) and B ($\beta = 0.277$, $p = 0.001$) were most influential, with no multicollinearity concerns (VIFs < 3.313).

- Model Performance: ANOVA ($F = 49.307$, $p = 0.000$) and adjusted R^2 (0.541) indicated moderate explanatory power.

Both models confirmed all hypotheses ($p < 0.05$), with Beneficiary integration (B) and Internal (I) emerging as critical drivers of supply chain performance. Lead time was more strongly predicted ($R^2 = 0.667$) than flexibility ($R^2 = 0.552$), suggesting contextual differences in variable impacts.

4.4. Discussion

The comparative analysis of the two regression models yields important insights into how different forms of supply chain integration shape humanitarian performance. Beneficiary integration emerged as the strongest determinant of lead time, whereas internal integration exerted the most pronounced effect on flexibility. This divergence underscores the need for differentiated strategies to enhance speed and adaptability in humanitarian operations.

Beneficiary integration proved consistently significant across both models ($\beta = 0.343$ for lead time; $\beta = 0.316$ for flexibility), confirming a growing consensus in the literature that community engagement is a cornerstone of effective humanitarian response (Balcik et al., 2010; Jahre & Heigh, 2008; Kovács et al., 2012). By embedding real-time needs assessments, participatory planning, and feedback loops into program design, humanitarian organizations reduce logistical mismatches, accelerate procurement, and optimize distribution schedules. Evidence from major

disaster responses, including Haiti (2010) and Nepal (2015), demonstrates that such practices shorten lead times by 20–30 percent and simultaneously enhance flexibility by enabling rapid adjustments in procurement, inventory, and delivery strategies (Bealt et al., 2016; Dubey & Gunasekaran, 2016). In this sense, beneficiary integration functions as both a timing mechanism and an adaptability enabler.

Internal integration showed a stronger effect on flexibility ($\beta = 0.351$) than on lead time ($\beta = 0.260$), supporting dynamic capability theory (Teece, 2007) and echoing evidence from past crises (Jahre et al., 2016). Cross-functional coordination among procurement, logistics, and field operations enables rapid resource reconfiguration when conditions change. While the immediate benefit of such integration is improved flexibility, its effect on lead time is indirect-operating through synchronized procurement cycles, pre-established escalation protocols, and reduced inter-departmental handoffs. This finding highlights a trade-off between alignment and speed: deeply integrated processes enhance adaptability but can sometimes introduce decision latency during the most time-critical phases of response (Kovács et al., 2012; Day et al., 2012).

Supplier integration revealed an asymmetrical pattern: a moderate positive effect on lead time ($\beta = 0.213$) but negligible influence on flexibility ($\beta = 0.001$). This paradox reflects the "dark side" of collaboration, whereby long-term agreements improve efficiency and predictability but constrain adaptive sourcing in rapidly evolving crises (Wiengarten et al., 2015; Scholten & Schilder, 2015). Although pre-negotiated contracts and framework agreements reduce procurement delays, they can inhibit rapid supplier switching when needs shift unexpectedly, limiting operational flexibility.

Government and partner integration showed modest but consistent effects across both models (coefficients 0.155–0.190). This pattern suggests a supportive rather than primary role, consistent with the relational view of supply chains (Dyer & Singh, 1998). Governments and partner NGOs contribute complementary resources, regulatory facilitation, and last-mile delivery capacity, thereby reinforcing operational resilience rather than fundamentally transforming performance outcomes. Interview evidence from UNRWA practitioners highlighted concrete mechanisms-such as expedited customs clearance, waivers for cross-regional operations, and leveraging local partner networks-that reduce bottlenecks and improve geographical coverage. Yet the influence of these actors remains highly context-dependent, shaped by regulatory environments, disaster type, and the phase of response.

Overall, the comparative analysis affirms that humanitarian supply chain performance hinges on different but mutually reinforcing integration pathways. Beneficiary integration directly accelerates lead time and enhances adaptability through real-time demand signaling and participatory planning. Internal integration equips organizations with dynamic capabilities to reconfigure resources and maintain flexibility under volatile conditions. Supplier, government, and partner integration provide supporting infrastructure and efficiency gains but can also introduce structural rigidities if not carefully managed. Taken together, these findings advance a more nuanced understanding of how distinct integration mechanisms affect speed and flexibility-the two performance dimensions most critical to saving lives and enabling effective humanitarian action.

4.5. Theoretical Implications

Theoretically, this study contributes to the humanitarian supply chain literature by offering a comprehensive examination of SCI that includes traditionally underexplored actors such as beneficiaries and host governments. While prior research has often emphasized supplier relationships and internal coordination, the present findings highlight the centrality of beneficiary engagement as a determinant of performance. This supports stakeholder theory by illustrating that operational effectiveness is enhanced when humanitarian organizations proactively integrate the needs and expectations of those they serve. Moreover, the relevance of government and partner integration reinforces the value of the relational view of supply chains, which posits that inter-organizational collaboration creates unique advantages in uncertain and resource-constrained environments.

4.6. Practical Implications

The practical implications of these findings are significant. Humanitarian agencies aiming to improve delivery speed and adaptive capacity must prioritize beneficiary-centered approaches and deepen collaboration with suppliers, governments, and implementing partners. Systems for participatory planning, shared information platforms, and multi-stakeholder coordination mechanisms should be viewed as essential elements of SCI, not as auxiliary components. In particular, the relatively high influence of beneficiary integration suggests that aid organizations can gain considerable performance improvements by incorporating feedback mechanisms and co-design processes into their operations.

Furthermore, the results call attention to the need for strategic engagement with governmental actors. Although government integration did not yield the highest coefficients, its statistical significance points to its foundational role in facilitating cross-border operations, securing permissions, and leveraging local infrastructure. As such, successful humanitarian interventions require alignment with national frameworks and ongoing dialogue with public institutions.

The consistency between the quantitative results and the qualitative insights strengthens the study's overall validity. Interviewees and field experts echoed the importance of multi-actor collaboration, particularly in protracted crisis contexts such as those observed in the operations of UNRWA. Their perspectives further affirmed that the integration of local partners and governments is not only a matter of efficiency but also of legitimacy and long-term sustainability.

5. Conclusion

This study provides robust empirical and theoretical evidence on how SCI drives performance in humanitarian contexts. By analyzing five integration constructs: beneficiary, internal, supplier, government, and partner integration, the research demonstrates that SCI significantly influences two core performance dimensions: lead time and flexibility. Unlike commercial supply chains, humanitarian operations face volatile and unpredictable conditions where time-critical decision-making and adaptive capacity are essential.

Findings highlight that beneficiary integration is the most influential factor, underpinning accurate needs assessment, informed logistical planning, and improved resource allocation, thereby reducing response times and enhancing adaptability. Internal integration emerged as a key enabler of operational flexibility, with cross-functional coordination supporting rapid adaptation to evolving demands and validating the dynamic capabilities perspective. Conversely, supplier integration showed a moderate effect on lead time but negligible influence on flexibility, revealing a trade-off between efficiency and adaptability inherent in long-term procurement arrangements. Government and partner integration exerted consistent yet secondary effects, offering regulatory facilitation, legitimacy, and logistical support rather than direct performance transformation.

Theoretically, the study extends SCI frameworks from commercial to humanitarian settings, reconceptualizing affected populations as active participants rather than passive recipients and positioning lead time and flexibility as primary indicators of effectiveness. The proposed

Integration Performance Contingency Framework also illuminates how integration mechanisms generate value under varying disaster phases and governance contexts. Practically, the research calls for institutionalized beneficiary feedback loops, strengthened cross-functional teams, adaptive procurement strategies, and deeper collaboration with governments and partners to balance speed and flexibility.

Limitations include the single-case focus on UNRWA, the cross-sectional design, and the exclusion of cost or environmental metrics, which may constrain generalizability. Future research should examine integration longitudinally, across diverse contexts, and in relation to emerging technologies, ethical considerations, and humanitarian-specific KPIs.

Overall, this study underscores that placing beneficiaries at the center of supply chain planning and reinforcing internal coordination constitute the twin pillars of agile, responsive, and effective humanitarian operations. These insights provide both a theoretical foundation and a practical roadmap for improving the speed and adaptability of humanitarian supply chains in complex and uncertain environments.

Author Contribution Statement

All authors contributed equally to the realization and writing of this manuscript.

Conflict of Interest

The authors declare no conflict of interest.

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