DIVERGENT METRICS: EXPLORING SUPPLY CHAIN PERFORMANCE IN HUMANITARIAN ORGANIZATIONS VERSUS PUBLIC AND PRIVATE SECTORS

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ABSTRACT

Humanitarian organizations operate under conditions that require rapid response and flexibility, often in crisis situations where traditional supply chain metrics may not be applicable. Their focus on speed, adaptability, and stakeholder engagement contrasts sharply with the public and private sectors, which typically prioritize efficiency, cost-effectiveness, and long-term strategic planning.

This paper investigates the differences in supply chain performance measurement between humanitarian organizations and the public and private sectors, highlighting the unique challenges and objectives that define each domain. Through a thorough literature review, we examine existing frameworks and metrics used in supply chain performance evaluation across these sectors.

To achieve this goal, a systematic literature review was conducted, analyzing 57 articles published between 2000 and 2024 across four databases: IEEE Xplore, Web of Science, Scopus, and JSTOR.

Our analysis reveals that while public and private sectors benefit from established performance metrics such as ROI and inventory turnover, humanitarian organizations often rely on qualitative measures and emergent indicators that capture the complexities of disaster response.

As a result, this research introduces a model for supply chain performance specifically tailored for humanitarian organizations. The model includes the most relevant metrics and attributes to assist both researchers and practitioners in their future work.

Keywords: performance of humanitarian supply chain, humanitarian organization, supply chain management

INTRODUCTION

Supply Chain Management (SCM) in its simple definition involves the coordination and management of all activities involved in the production and delivery of goods and services, from raw material sourcing to the delivery of finished products to customers (Oliver & Webber, 1982). The effective management of the supply chain can lead to cost savings, improved customer service, and increased profitability which are key elements to achieve sustainable competitive advantage (Markley & Davis, 2007). Thus, Supply Chain Management can serve as a valuable tool for integrating all elements and processes, enabling the implementation of a tailored strategy that enhances both the effectiveness and efficiency of the organization. Additionally, it improves the organization's ability to respond to uncertainties (Christopher M.

, Logistics & supply chain management, 2017). There is no distinction in using this simple definition of SCM across the private sector, public sector, and humanitarian organizations.

Numerous scholars have emphasized the importance of supply chain management in improving organizational performance. For example, Schliephake, Stevens, and Clay (2009) argued that supply chain management plays a crucial role in repositioning organizations, while Craig, Hult, and Ketchen (2009) suggest that an innovative supply chain can contribute to superior organizational performance. Additionally, studies by Todd and McGrath (PRTM), on integrated supply chain benchmarking and supply chain operations reference model, shows that the gap in performance between organizations becomes more wide and this gap cannot be bridged with no efficient supply chain where organizations pay less for a well-structured supply chain which enables the organization to outperform its competitors (Stewart, 1997).

Therefore, researchers have been studying over the years how to involve the strategic alignment of functions and processes of supply chain to have better performance through a true design of supply chain that can achieve cost reduction and reduced lead time. And that is mainly a focus on which part of supply chain plays the most important role in leverage the performance (Markley & Davis, 2007). Scholars suggest many models with some key factors to focus, examples for this is the Information Technology (IT) aspect in facilitating the integration of various supply chain processes and functions (Kim, Cavusgil, & Cavusgil, 2013; Rai, Patnayakuni, & Seth, 2006). Other example is to adopt green supply chain management as a way to improve supply chain performance while also addressing environmental concerns (Hervani, Helms, & Sarkis , 2005; Diabat & Govindan, 2011). Resilience is another important aspect which refers to the ability of the supply chain to respond effectively to disruptions, such as natural or human disasters (Linnenluecke, 2017) and last but not least, the integration of supply chain processes and functions (Caputo & Valeria , 1996; Trkman, Indihar , & Jaklic, 2007).

However, despite these efforts, there remains a gap in understanding the concept of supply chain management and how to define its performance. This definition can vary significantly between organizations and their respective sectors, making generalizations challenging. The next section will provide further insights into the concept of humanitarian and nonprofit organization, which helps to clarify the nuances of supply chain differences across sectors, highlighting the key distinctions inherent to each organizational context.

Humanitarian or nonprofit organization

A nonprofit organization, also known as a humanitarian or not-for-profit organization, is an entity that operates to promote a particular social cause or serve a specific group of people without the primary goal of making a profit. (Courtney, 2002).

There is an increasing involvement of nonprofit sector globally in all people's life aspects. Statistics shows that over 7 million individuals, represents 6.8 per cent of the total workforce, are working in full time job at nonprofit organization. In the UK, there are about 240,000 nonprofit organizations with about one million workers (Courtney, 2002).

Anthony and Young (1984) define the non-profit organization as "an organization whose goal is something other than earning a profit for its owners. Usually, its goals are to provide services". Anthony and Young build on the definition of the organization with characterizing the goal of non-profit organization with two main qualities; the feature of nonprofit and propensity towards voluntary services.

Nonprofits can take various legal forms, including charities, foundations, and social enterprises (Attorney , 2021). The anthology of nonprofit organization imposes institutional settings that make a differential with profit ones. These differences posse redefinition of organizational

culture, objectives, processes and functions based on social choice (DiMaggio & Anheier, 1990). Despite there is a clarity in literature on anthology of public and private organizations, however, there is ambiguity in classification of nonprofit organizations. Some schoolers argue the non-existence of a third classification, and non-profit organization is defined as part of public sector because it follows the public policy process and has similar objectives of building social capital and though non-profit organization. In other words current conceptualization of public sector is well fitting for nonprofit organizations (Boris & Mosher-Williams, 1998; Gronbjerg, 1994; Kearns, 1994).

Others claim that non-profit organization is a separate model of organization that has a definite scope of mission, goals, objectives, management practices and advocacy (Drucker, 1990). They also argue on the goal of nonprofit organization is different than privet incorporate for maximizing profit and public sector for maximizing quantity and quality of services provided to civilians. The goal is defined under a scope of maximizing objective defined function, function could be education, health, environment or any other form of services (Schiff & Weisbrod, 1991). Nonprofits measure success not in terms of financial profit, but in terms of the impact they make on their beneficiaries and the communities they serve (Boris & Mosher-Williams, 1998).

Nonprofit organizations differ from both public and private organizations in ownership. While public organizations are government-owned and private organizations are typically owned by shareholders, nonprofits are owned by no one and exist solely to serve their mission. One key difference between nonprofits and public organizations is the source of their funding. Public organizations, such as government agencies and departments, are primarily funded by taxpayers, while nonprofits rely on donations, grants, and other forms of external funding to support their operations. This funding model gives nonprofits more flexibility and independence than public organizations, which may be subject to political pressure or budget cuts (Kearns, 1994). Another key difference between nonprofits and private organizations is their legal status. Private organizations are typically structured as for-profit corporations, while nonprofits are structured as tax-exempt entities. This tax-exempt status allows nonprofits to receive tax-deductible donations from individuals and corporations, making it easier for them to raise funds and carry out their mission (Boris & Mosher-Williams, 1998).

In conclusion, nonprofits differ from public and private organizations in several ways, including their funding sources, legal status, decision-making processes, and goals and objectives. Nonprofits exist solely to serve their mission and the public good, and rely on donations, grants, and other forms of external funding to support their operations. Nonprofits play a crucial role in addressing social and environmental issues, and by supporting them, individuals and businesses can contribute to creating positive social change (Courtney, 2002).

Many scholars confirm the increasing role of nonprofit organizations due to the growing rate of humanitarian crises occurrence, including natural disasters such as pandemics like EVD and Covid-19, severe floods, tsunami, earthquakes and forest fires, or human disasters such as wars and conflicts around the world. Humanitarian crises enforce vulnerability and instability in communities that lay beyond the capacity of local governments to respond. This highlights the need for having nonprofit organizations to bridge the gap through their responsive capacity (Adler, Glymour, & Fielding, 2016; Vink, Koskela-Huotari, & Tronvoll, 2020; Boenigk, Kreimer, Becker, & Alkire, 2021).

Statement of problem

The humanitarian organizations are responsible for delivering critical supplies, including food, medicines, and other humanitarian aids, to vulnerable communities during natural and man-made disasters around the world (Queiroz, Renato, & Silvia , 2020). Supply chain cannot be

considered only as the center of any humanitarian response to increasing conflict around the world; but it is also the most expensive part. Sixty to eighty per cent of the cost of humanitarian aid is a cost related to supply chain (OCHA, 2015). Therefore, the supply chain of humanitarian organizations should act at a high performance in order to be responsive and cost effectiveness and at the same extent should avoid as much as possible any disruption or break in supplies or commodities.

In recent decades, the effectiveness of humanitarian supply chains has been hindered by numerous challenges, resulting in suboptimal performance in delivering essential supplies to those in need. There are many examples where humanitarian organizations could not respond in time to humanitarian situations, where they had a cut in supplies or provided derivable at high cost.

One of the common examples is the earthquake disaster occurred in Pakistan on October 8, 2005. The earthquake was massive, with a magnitude of 7.6 on Richter scale. It hits 95 kilometers northeast of the capital Islamabad, affecting all region of South Asia including Afghanistan and India. Ripple of following earthquakes continued for next few months. The earthquake had a severe impact on the people, 73,000 persons were killed, and 3.5 million individuals were internally displaced. Despite all efforts exerted by humanitarian organizations and the local government, however supply chain of humanitarian relief needs failed to respond specially in remote villages (Gattorna, 2016).

A similar incident of the Turkey-Syria earthquake unfolded on February 6th, 2023, causing widespread devastation to critical logistics infrastructure. According to the Turkish authorities, key ports and near airports had a severe damage. Unusable highways rendering truck transportation virtually impossible due to impassable roads. Concurrently, power outages disrupted industrial output, leading to substantial delivery delays, and bringing the whole supply chain to a bottleneck (Turkishmaritime, 2024). These impressive challenges have triggered significant delays in the delivery of essential goods, resulting in severe bottlenecks within the humanitarian supply chain. Regrettably, this impacts the timely delivery of life-saving materials to the affected people in dire need (Kowalczyk, 2023).

Also, one of recent examples, in 2020, the World Health Organization (WHO) faced significant challenges in its supply chain for personal protective equipment (PPE) during the COVID-19 pandemic. The global demand for PPE surged, leading to shortages and delays in the procurement and delivery of supplies. The WHO called for urgent action to address these challenges and improve the availability of PPE for health workers around the world (WHO, 2020).

In 2018, the United Nations Children's Fund (UNICEF) faced challenges in its supply chain for vaccines in several countries. In Nigeria, one of the clear examples, delays in the procurement and distribution of vaccines led to shortages, and some children were not vaccinated on schedule. The agency worked with the government and other partners to address these challenges and ensure that children received the vaccines they needed (unicef, 2022).

And last but not least, another example of World Food Programme (WFP), in 2017, when faced transportation and logistics challenges in delivering food assistance to vulnerable communities in Yemen. The ongoing conflict in the country made it difficult to access some areas, and the agency had to rely on airdrops to deliver supplies. However, airdrops are expensive and can be challenging to coordinate, resulting in delays and shortages (WFP, 2022).

Based on the previously mentioned review, it is apparent that the efficiency and responsiveness of the humanitarian supply chain can be hindered by numerous challenges. In a study conducted on 40 humanitarian organizations operating in Kenya, five factors were identified as

contributing to these challenges: unclear definition of the role of supply chain management in humanitarian operations, interruptions in the operation caused by domestic barriers, uncertainty in demand due to unforeseen emergencies, difficulty in accessing targeted beneficiaries, and fluctuation in material prices due to increased demand (Nyamu, 2012).

The research problem derives from the context described above. Challenges in supply chain management of humanitarian organizations are increasing by high level of uncertainty in the environment while there is a global limitation in performance of the humanitarian supply chain. This condition can be interpreted by the lack of efforts in humanitarian supply chain design, which reflects negatively on the operation and results in poor services provision.

This study addresses a critical gap in the existing literature by proposing a structured and contextualized framework for understanding performance of supply chain for humanitarian organizations. Unlike current literature, which primarily focuses on supply chain models for public or private entities, this research introduces a performance model of humanitarian supply chain.

Humanitarian Supply Chain Performance

Tan and his colleagues define the performance of supply chain as "the effective management of internal competencies and practices related to supply chain that can achieve a competitive advantage" (Tan, Kannan, & Handfield, 1998). This definition gives a broad vision on what the performance of supply chain should be, and results gained by achieving this performance. However, this definition lacks determination of the performance notion and what metrics could be used to capture it.

Despite the wide agreement on the importance of supply chain management in the operation at any organization, however there is no agreement on how to define the performance of supply chain, and according to what model and instrumental measures. The confusion in defining performance of supply chain refers to two main reasons. Firstly, there are many departments involve in supply chain and each business unit has its own scope of work and success indicators to measure performance. For example, sales department links performance of supply chain with high rate of sales and high number of customers reached. While supply department considers supply chain performs well when it has a short lead time, production management focuses on low cost of materials, quality and turnover of stock. The second reason refers to the notion of supply chain itself. Supply chain management is usually viewed in abstract which makes it difficult to find instruments to measure elements of performance (Bechtel & Jayaram, 1997; Dong-Young , 2013; Rai, Patnayakuni, & Seth, 2006).

Before exploring supply chain performance, it's important to examine how overall organizational performance is assessed. Typically, performance metrics fall into two categories: financial and operational. Financial metrics focus on strategic indicators related to economic outcomes, such as return on investment (ROI). In contrast, operational metrics address tactical aspects crucial for short- to mid-term activities, like lead time (Carton & Hofer, 2006).

However, some researchers point out that organizations often fail to balance these two types of metrics. This imbalance arises because managers tend to concentrate their analytical efforts on financial metrics, while researchers emphasize operational metrics when designing measurement frameworks (Van Looy & Shafagatova, 2016).

When narrowing the concept of performance to specifically address supply chains, a range of financial and operational metrics is proposed to evaluate performance based on organizational best practices. Scholars propose approximately 12 different indicators and metrics for measuring supply chain performance, each with varying levels of priority and significance. These metrics include Return on Investment (ROI), Total Supply Chain Cost, Lead Time, Order

Fulfillment Rate, Inventory Turnover, Perfect Order Rate, Quality Metrics, Customer Satisfaction, Flexibility, Supplier Performance, Cash-to-Cash Cycle Time, and Sustainability Metrics (Saleheen & Habib, 2022; Gunasekaran, Patel, & McGaughey, 2004). The scorecard technique is often employed to evaluate the weight of each metric, helping to determine its importance within the proposed supply chain model (Beamon, 1999).

To gain a clearer understanding of these metrics and their importance in relevant to the sector of the supply chain, a systematic literature review was conducted, analyzing 57 articles published between 2000 and 2024 across four databases (IEEE Xplore, Web of Science, Scopus and JSTOR). After removing duplicates and posterizing those focus on SC performance, only twenty sex studies were retained and summarized in Table 1. This includes thirteen studies focus on supply chain performance metrics in the private sector, five in the public sector (government), and eight in the humanitarian sector. Together, these insights provide a comprehensive view of supply chain performance and highlight areas for improvement.

Table 1 Studies focus on SC performance metrics

Study	Reference	Focus metrics	Sector
Performance of supply chain collaboration – A simulation study	(Ramanathan, 2014)	Cost	Private sector
Measuring and managing sustainability performance of supply chains: Review and sustainability supply chain management framework	(Schaltegger & Burritt, 2014)	Cost – Quality	Private Sector
Enhancing supply chain performance through supply chain practices	(Hove-Sibanda & Pooe, 2018))	Cost – Quality	Private Sector
Supply chain performance measurement: a literature review	(Arzu Akyuz & Erman Erkan, 2009)	Flexibility	Private Sector
A framework for supply chain performance measurement	(Gunasekaran, Patel, & McGaughey, 2004)	quality, Time, dependability, Flexibility and Cost	Private Sector
Supply Chain Performance Measurement Model: A Literature Review	(Saleheen & Habib, 2022)	Cost	Private sector
Measuring supply chain performance	(Beamon, 1999)	Flexibility	Private sector
Organizational structures and the performance of supply chain management	(Kim S. , 2007)	Time - Cost	Private sector
Developing environmental supply chain performance measures	(Shaw, Grant, & Mangan, 2010)	Time - Cost	Private sector
The impact of innovativeness on supply chain performance: is supply chain integration a missing link?	(Seo, Dinwoodie, & Kwak, 2014)	Time - Cost	Private sector
The study of supply chain management strategy and practices on supply chain performance	(Lapide L. , 2000)	Cost -Turnover-Leadtime	Private sector
The Study of Supply Chain Management Strategy and Practices on Supply Chain Performance	(Sukati, Hamid, Baharun, & Yusoff, 2012)	Flexibility	Private sector

Supply chain performance metrics	(Hausman, 2004)	Quality-Turnover	Private sector
Influence of supply chain management practices on performance of government ministries in Kenya	(Apopa, 2018)	Time - Cost	Public sector
Business Performance Through Government Policies, Green Purchasing, and Reverse Logistics	(Hashmi, 2023)	Cost	Public sector
Effect of inventory management practices on supply chain performance of government health facilities in Kisumu county in Kenya	(Odhiambo & Kihara, 2018)	Inventory - Turnover	Public sector
Procurement and Supply Chain Management in government institutions: A case study of select departments in the Limpopo Province, South Africa	(Selomo & Govender, 2016)	Cost	Public sector
Developing environmental supply chain performance measures	(Mhelembe & Mafini, 2019)	Quality - Flexibility	Public sector
Humanitarian supply chain performance management: a systematic literature review	(Abidi, De Leeuw, & Klumpp, 2014)	Time	Humanitarian
Dynamic capabilities in humanitarian supply chain management: a systematic literature review	(Polater, 2020)	Flexibility	Humanitarian
Humanitarian logistics and supply chain standards. Literature review and view from practice	(Paciarotti, Piotrowicz, & Fenton, 2021)	Time - Flexibility	Humanitarian
A SCOR framework to measure logistics performance of humanitarian organizations	(Lu, Goh, & Souza, 2016)	Time - Flexibility	Humanitarian
Humanitarian–business partnerships in managing humanitarian logistics	(Nurmala, Leeuw, & Dullaert, 2017)	Flexibility	Humanitarian

Key performance indicators in humanitarian logistics: A systematic literature review 2010-2020	(da Silva, Fontana, Vidal, & Marque, 2024)	Time Flexibility	- Humanitarian
An integrated AHP-based scheme for performance measurement in humanitarian supply chains	(Anjomshoae, Hassan, & Wong, 2019)	Time Flexibility	- Humanitarian
Developing Performance Measurement Tool for Slow-Onset Humanitarian Supply Chain Operation	(Bhusiri & Ling Tay, 2021)	Time Flexibility	- Humanitarian

In this discussion, there will be a focus on four key dimensions of the previously mentioned twelve performance indicators. Three key metrics—time, quality, and cost—will be analyzed, as emphasized by most scholars (summarized in Table 1) based on best practices. Additionally, a fourth dimension: flexibility will be addressed.

Prior to proceeding with a detailed analysis of the three attributes - time, quality, and cost - it is essential to define best practices which is the basis of identification of these three constructs. According to Szulanski's (1996) a practice refers to “the organization's routine use of knowledge and often has a tacit component, embedded partly in individual skills and partly in collaborative social arrangements".

The first attribute is time, which representing the duration it takes for goods to transition from their origin to the end customer , and usually time is discussed in two metrics: customer wait time and requisition wait time or in other terminology : inbound time and outbound time (Garcia, Marchetta, Camargo, Morel, & Forradellas, 2012).

The second attribute is Quality which plays a crucial role in the performance of a supply chain, serving as a critical determinant of overall customer satisfaction and organizational success (Arzu Akyuz & Erman Erkan, 2009). In the context of supply chain management, quality encompasses measures which represents nonfinancial indicators but they intercorrelated to important strategic aspects, including the reliability, durability, safety, and conformity to specifications of the products or services being delivered (Karamouz, Ahmadi Kahnali, & Ghafournia, 2021). Achieving and maintaining quality standards requires effective quality control measures, supplier management, thorough inspection processes, and adherence to industry regulations and standards. By ensuring that quality is upheld at every stage of the supply chain, organizations can enhance their reputation, gain a competitive edge, and foster long-term relationships with customers and partners (Li , Yan, Zhang, & Yan, 2020).

The third aspect of the triangle is cost, which represents the financial considerations associated with the performance of a supply chain. Cost plays a crucial role in supply chain management as organizations, including public, private, and humanitarian ones, strive to optimize their operations and achieve cost-efficiency without compromising on quality and timeliness (Lee, Seo, & Dinwoodie, 2016). Managing costs within the supply chain involves various components, including procurement, production, transportation, inventory management, and distribution. By implementing cost-effective strategies and practices, organizations can minimize expenses, maximize profitability, and ensure the affordability of products or services (Li , Yan, Zhang, & Yan, 2020). The organization usually does many approaches to optimize the cost in the supply chain. These approaches include negotiating favorable pricing with

suppliers, reducing waste and inefficiencies, streamlining processes, implementing lean practices, optimizing transportation routes, and employing technology and automation to enhance operational efficiency (Lee, Seo, & Dinwoodie, 2016).

SC Performance Trade-offs

While cost reduction is a critical objective, it is important to strike a balance with other performance dimensions such as quality and time. Pursuing excessively low costs may lead to compromised quality, delayed delivery, or inadequate customer service, which can ultimately have a negative impact on customer satisfaction and organizational reputation. The challenge lies in finding the optimal balance between cost and other performance factors. Supply chain managers must carefully analyze cost drivers, evaluate trade-offs, and make informed decisions to achieve the desired cost-effectiveness while meeting customer expectations (Vafaei-Zadeh, Ramayah, Hanifah, & Kurnia, 2020).

In the realm of supply chain management, the assessment of performance often revolves around three key attributes: time, quality, and cost. However, the realization that it is challenging to achieve peak levels in all three dimensions simultaneously is a pivotal understanding for organizations. Recognizing the inherent trade-offs involved, organizations must adopt a strategic mindset that allows for prioritizing one or two of these attributes over the others (Kim S. , 2006). This intentional prioritization doesn't imply neglecting the remaining factors but acknowledges that adjustments might be necessary to strike an optimal balance. For instance, an organization may choose to emphasize timely delivery, prioritizing efficiency and reducing lead times, but this might necessitate a nuanced approach to cost management. Conversely, a focus on high-quality products may require more resources and time, impacting the cost and potentially extending delivery timelines. The key is to align the supply chain strategy with the overall organizational goals and market demands. By doing so, organizations can navigate these trade-offs intelligently, ensuring that the chosen emphasis aligns with customer expectations and industry standards.

This strategic trade-off approach is essential for maintaining a realistic and achievable supply chain performance. It enables organizations to adapt to dynamic market conditions, customer preferences, and unforeseen challenges, fostering resilience and sustainability in the face of complexity. As supply chain dynamics continue to evolve, the ability to make informed trade-offs becomes a cornerstone for success in achieving and maintaining optimal supply chain performance (Voldrich, Wieser, & Zufferey, 2020).

Building on that, the organization finds itself in a situation where it has to do a trade-off between one and other factors which adds more complexity in suggesting an appropriate model to present performance of supply chain (Dong-Young , 2013). Quick delivery requires to do a rapid assessment and fast upstream communication in the supply chain to procure goods which affects quality and cost. Procurement of affordable goods requires longer time of conducting market survey. Quality as well may need time to assess the needs of customers and match the needs and wants which applies more cost. Therefore, organizations should consider what performance of supply chain means according to the organization goals and objectives, and so it can determine what the most important attributes are which support achieving the goals of the organization. For instant, cost is the most important factor which serves the goal of commercial incorporates in maximizing profit. Some firms are looking for a differential product in their strategic goals which give more attention to quality rather than time and cost. Manufactures of luxury vehicles could be given as an example (Bozarth & Handfield, 2008; Christopher, 2017).

The literature offers a clearer explanation of the tradeoff shapes in supply chain performance elements and how these shapes vary across different sectors. As illustrated in Table 1, in private

sector, a supply chain that prioritizes and consistently delivers high-quality goods and services not only enhances customer trust and loyalty but also minimizes the likelihood of product recalls, returns, or negative reviews (Gattorna, 2016). However, in the humanitarian sector, the significance of quality is elevated even further, as it takes on a deeper meaning beyond mere product or service attributes. It is deeply linked to promoting dignity, respecting cultural values, and upholding the rights of affected individuals and communities. By prioritizing quality, humanitarian organizations can effectively meet the needs of those they serve and contribute to meaningful and sustainable outcomes in times of crisis (Hashemi, Handayanto, Masudin, Zulfikarijah, & Jihadi, 2022). However, in humanitarian organizations, the importance of quality cannot be compared to that of time. In this context, supply chain performance is defined primarily by the urgency of delivery. Rapid provision of materials or services to beneficiaries is essential for saving lives, making time the foremost priority over other factors such as quality and cost (Ivanov, Tsipoulanidis, & Schönberger, 2019).

Many scholars prioritize specific elements beyond the traditional three constructs – time, cost, and quality- and a crucial factor associated with supply chain performance is 'Flexibility' (Polater, 2020). Flexibility encompasses the ability of a supply chain to promptly and adeptly respond to sudden or unplanned shifts in demand, thereby ensuring the smooth flow of goods and services in the time of crisis or humanitarian emergencies It refers to the agility and adaptability of the system to accommodate unexpected changes in demand patterns, market conditions, or disruptions in the production and distribution processes. It encompasses various aspects, including but not limited to, the responsiveness of suppliers, the ability to quickly adjust production schedules, the availability of alternative sourcing options, and the capacity to rapidly deploy resources to areas in need (Childerhouse, Lewis, Naim, & Towi, 2003).

According to Heaslip et. al (2014), humanitarian and military supply chains are similar in having special qualities that make them different than the one in private sector. Both supply chains have a considerable flexibility to respond in time despite short notice and they focus on accomplishing the mission in time, therefore their performance measures are time centered. One of the key reasons why flexibility holds immense significance in the context of humanitarian organizations is the inherently unpredictable nature of their operations (Kovács, Tatham, & Larson, 2012).

Humanitarian crises, such as natural disasters, conflicts, or disease outbreaks, often result in sudden surges in demand for critical supplies and services. In such scenarios, the ability of the supply chain to swiftly adapt and respond becomes paramount to saving lives and alleviating suffering. By incorporating flexibility into their supply chain strategies, humanitarian organizations can proactively identify and respond to emerging needs, ensuring that aid reaches the affected areas in a timely manner (Kalyar, Shafique, & Ahmad, 2020). Furthermore, flexibility in the supply chain allows for a proactive response to emerging needs. Humanitarian organizations often operate in dynamic and volatile environments where conditions can change rapidly. This includes changes in funding positions, trends of support approaches of stakeholders and legal space given by local governments (Chopra & Meindl , 2010).

However, achieving supply chain flexibility requires a comprehensive and integrated approach. It involves establishing robust communication channels and collaborative relationships with suppliers, manufacturers, distributors, and other stakeholders. Close coordination and information sharing among these entities enable rapid decision-making and facilitate the necessary adjustments in response to changing circumstances (Kalyar, Shafique, & Ahmad, 2020).

Before concluding this section, it is worth highlight that there are many challenges could hamper the overall supply chain performance, particularly humanitarian supply chain, in terms

of efficiency and responsiveness. A research surveyed 40 humanitarian organizations operate in Kenya, and it identifies five different factors which are: a lack of well-definition of the role of supply chain management in humanitarian operation; interruptions in the operation due to domestic barriers; uncertainty in demand due to unplanned emergencies; failure in in accessing targeted beneficiaries; fluctuation in materials prices due to a spike demand (Nyamu, 2012).

This underscores the importance of two key elements: flexibility and time for humanitarian supply chain performance. Nayamu's study highlights how all challenges are connected to these two crucial factors.

Performance of humanitarian supply chain model

Building on the earlier discussion, the proposed model focuses on two key attributes: time and flexibility, selected from the four previously outlined performance dimensions. These elements are particularly critical in the context of humanitarian supply chain performance.

Time necessitates robust internal integration within organizational processes, supported by a well-established IT infrastructure that enables seamless communication and coordination. This integration is essential for ensuring that resources are delivered swiftly to those in need.

On the other hand, flexibility demands a high level of coordination among various stakeholders, including suppliers, beneficiaries, government entities, partners, and donors. Effective collaboration among these groups is vital for adapting to changing circumstances and meeting the dynamic needs of humanitarian efforts.

By emphasizing these two metrics—time and flexibility—this model (illustrated in Figure 1) provides a comprehensive framework for assessing the performance of humanitarian supply chains. Utilizing these criteria allows for a more thorough evaluation, enabling organizations to better judge their effectiveness and improve their responsiveness in critical situations.

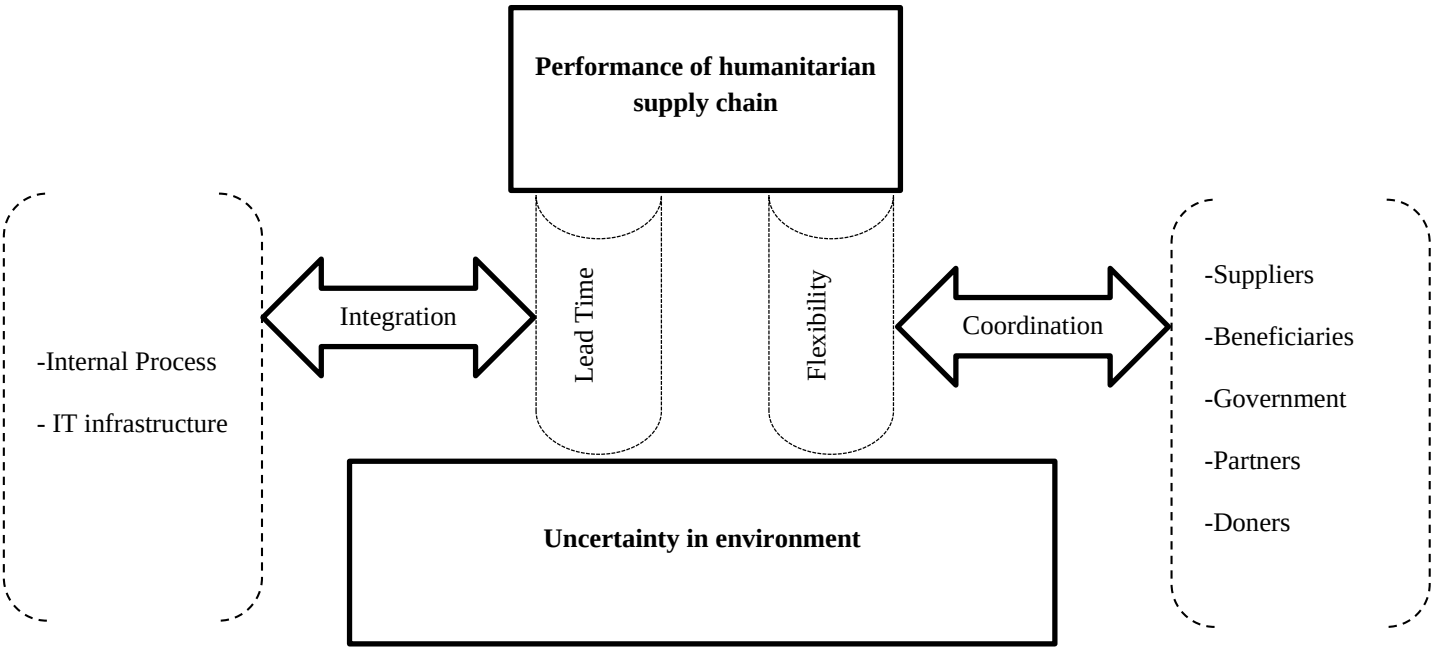

Figure 1: Performance of humanitarian supply chain model

CONCLUSIONS

This paper highlights the distinct challenges and performance measurement dynamics of humanitarian supply chains compared to their public and private sector counterparts. As humanitarian organizations strive to deliver critical supplies under often unpredictable and resource-constrained conditions, the necessity for a tailored performance model becomes evident. Our analysis reveals that traditional metrics, which emphasize efficiency and cost-effectiveness, fall short in addressing the urgent and flexible nature of humanitarian operations.

The proposed model, centers on the dimensions of time and flexibility, provides a vital framework for understanding and improving humanitarian supply chain performance. By prioritizing rapid response and adaptability, organizations can enhance their ability to meet the pressing needs of vulnerable populations during crises. The trade-offs inherent in supply chain management—balancing cost, quality, and time—underscore the complexity of these operations. However, recognizing that time is often the most critical factor in humanitarian contexts allows organizations to align their strategies with their overarching goals of saving lives and alleviating suffering.

Ultimately, the findings of this study emphasize the importance of developing specialized metrics that reflect the unique realities of humanitarian supply chains. This can lead to a paradigm shift in how performance is assessed and managed in these contexts. By prioritizing not just speed and adaptability, but also collaboration among stakeholders, humanitarian organizations can create a more cohesive and efficient response framework. The ongoing dialogue between theory and practice will be essential in driving innovation and effectiveness in humanitarian supply chain management.

In conclusion, this study not only fills a critical gap in the existing literature but also serves as a practical guide for researchers and practitioners alike. By adopting the proposed performance model, humanitarian organizations can better navigate the complexities of their supply chains, ultimately leading to more effective and timely aid delivery in times of need. Furthermore, this model encourages ongoing evaluation and adaptation, ensuring that organizations remain responsive to the evolving challenges they face. As the humanitarian landscape continues to change, the insights from this research can help foster a more resilient and impactful approach to crisis response.

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