

THE ROLE OF EMERGING TECHNOLOGIES IN ENHANCING TRANSPARENCY IN HUMANITARIAN LOGISTICS: SYSTEMATIC LITERATURE REVIEW BETWEEN 2010 AND 2023

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Abstract: *This systematic literature review critically examines the influence of technology on transparency and humanitarian logistics between 2010 and 2023. The study employs the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) methodology to analyse a comprehensive selection of peer-reviewed journal articles. The review identifies a growing body of literature that explores the potential of emerging technologies, such as blockchain, artificial intelligence (AI), and Internet of Things (IoT), to improve transparency in humanitarian logistics. The integration of these technologies is proposed to enhance collaboration, supply chain agility, and information flow. Hence, this systematic review provides a better understanding of the potential benefits of technologies in humanitarian logistics while highlighting the need for further research.*

Keywords: *Technologies; Transparency; Humanitarian Logistics; Systematic Literature Review.*

1. INTRODUCTION

Natural and man-made disasters have increased in frequency in recent years. Over 2 billion people are impacted by climate-related hazards disproportionately affect developing nations. Almost 385 natural disasters struck the world in 2010, leaving 217 million people affected, 297,000 dead, and \$123.9 billion in damages. Between 1970 and 2010, disasters claimed the lives of about 2.4 million people in South Asian countries alone, resulting in damages estimated to be worth USD 105 billion [12]. Anjomshoae et al. [2] note in their analysis that while humanitarian help for major crises has significantly increased, over 82 million people were displaced globally in 2020 because of conflict and violence. Furthermore, crises and catastrophic occurrences can cause significant pain and misfortune to people and communities [10]. In addition to natural disasters, the number of floods occurring globally each year increased to 223 in 2021 from an average of 163 per year between 2001 and 2020 [16].

For this reason, there has been a noticeable growth in the use of technology in humanitarian assistance efforts in severe situations. Emerging technologies such as blockchain, artificial intelligence, and 3D printing have the potential to enhance transparency in humanitarian logistics, particularly in the use of financial resources [19]. In line with Khan et al. [10], IoT and BCT integration improve humanitarian logistics performance and offer insights to for-profit and nonprofit organizations. These technologies can mediate transparency and sustainability in humanitarian logistics, leading to more efficient disaster relief operations [11]. Digitalization, in particular, plays a crucial role in creating transparency and building trust in the system [9]. A post-disaster operational model that emphasizes transparency, responsiveness, and efficiency, mediated by trust in humanitarian organizations, can further enhance the performance of humanitarian logistics [13]. Therefore, Baudier et al. [5] provide the vital benefits of blockchain for humanitarian

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relief efforts to boost public faith in charitable organizations, which might result in more contributions and a more significant impact on relief operations. As a result, adopting emerging technologies in humanitarian logistics is expected to positively impact the transparency and effectiveness of aid delivery, especially in the context of recent advancements and research in this field.

Our assessment is also significant considering the current drive for increased use and influence of technology on transparency and humanitarian services. As a result, this systematic literature review will concentrate on technologies in humanitarian logistics. Our review will address the study topic, "How does technology affect transparency and humanitarian services?"

Three distinct elements serve as the foundation for our systematic literature review structure. We have first covered the critical parts of our topic. Next, we will present the approach employed to write this study. The third section will present the results and analysis derived from the literature on humanitarian logistics, technology's impact on transparency, and descriptive analysis. We finally wrapped up our paper.

2. METHODOLOGY USED

We shall use the PRISMA methodology (Preferred Reporting Items for Systematic Reviews and Meta-Analysis). The PRISMA approach must be applied rigorously, which includes carefully selecting and analyzing relevant publications for the systematic literature review. Because PRISMA methodology provides systematic and well-defined criteria and processes for the methodical identification, selection, and analysis of relevant papers, we have employed it in our review. Our PRISMA-based literature search finished in December 2023, as Fig. 1 (PRISMA) displays the SLR procedure.

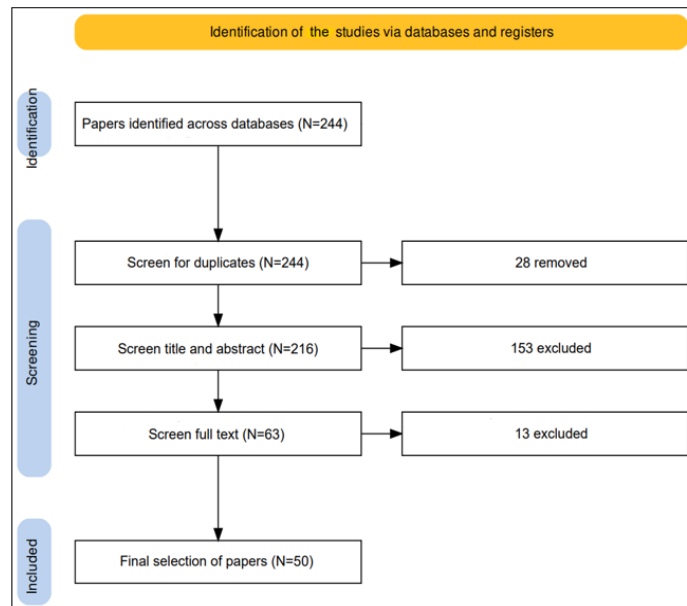


Figure 1. SLR process using the PRISMA

Aside from Table I, there are the keyword combinations used and inclusion and exclusion criteria to select the final collection of papers.

Table I.

Keyword combinations used, inclusion and exclusion criteria.

Inclusion criteria	Exclusion criteria	Keywords
Peer-reviewed journals. English articles. Internationale conference.	Master or doctoral theses, White papers, Technical research reports, Conference proceedings and non-English articles.	(Transparent* OR Transparent* OR Transparency*) AND (Humanitarian Supply Chain* OR Humanitarian Logistics* OR Humanitarian Disaster Relief Operation*).

3. FINDINGS AND ANALYSIS

The research results were split into two categories for examination. To address our research question, the first step entails descriptive analysis, and the second step concentrates on the content of the publications and how technology influences transparency and humanitarian services.

3.1. Descriptive analysis

The number of papers collected was 50 between 2010 and 2023. We haven't found any publications in three years as appears in Fig. 2.



Figure 2. Annual Number of papers.

A list of journals that have published two or more publications is shown in Fig. 3.

Moreover, the number of papers varies by country. Pakistan is the country that contributes the most to the publications (8 papers), followed by the United Kingdom and the United States of America (5 papers). Four pieces are also published in India, France (3

papers), Thailand, South Korea, Korea, and Malaysia (2 papers), among other prominent nations. The remaining ones have each contributed one publication.



Figure 3. Number of papers by journal (included if $(n > 2)$)

3.2. Influence of technology on transparency and humanitarian services literature

This study examines the body of research on the effects of emerging technologies on humanitarian relief distribution and transparency. Mobile connection, blockchain platforms, artificial intelligence, and sophisticated tracking systems are ushering in more transparent and responsible crisis management. Nonetheless, there are still ongoing obstacles to widespread acceptance.

Tracking Systems. Humanitarian aid supply chains can function much better when IoT and Blockchain are integrated, especially regarding responsiveness and flexibility [1] and RFID. This can strengthen cooperation between businesses and their suppliers and increase the speed at which help is delivered to needy individuals [15]. Moreover, RFID technology may be used to track shared materials, automate material tracking, and determine the initial location of materials, improving supply chain readiness and lowering theft loss [8]. Lastly, although it would necessitate significant adjustments, implementing Physical Internet principles, which emphasize hyper connectivity, may improve the efficiency of humanitarian supply chains [7].

Blockchain Platforms. Blockchain technology can increase trust and transparency in the supply chains for humanitarian aid and healthcare, as demonstrated by Baharmand et al. [3]. However, they also list several obstacles to its broad adoption, including lack of technical expertise, privacy difficulties, and legal constraints. Moreover, Khan et al. [10] provide insights for both commercial and non-profit organizations by examining the integration of IoT with BCT to improve humanitarian logistics performance. Potential implementation difficulties with these technologies are also identified. Rugeviciute [18] delves more into these obstacles within the framework of development assistance organizations, stressing the importance of additional study and real-world implementations. Lastly, according to Baudier et al. [5] blockchain technology's distinct characteristics as decentralization, immutability, and auditability to improve transparency and traceability in

charitable contributions. These attributes facilitate the following elements of traceability and transparency in charitable donations.

Artificial Intelligence. A thorough review of AI techniques, such as machine learning, and their possible uses in data management is given by Serey [20]. The study emphasizes how crucial human judgment is to enhancing AI's capacity for pattern identification. Bundy [4] talks about the necessity for ethical considerations and the possible effects of AI, especially in limited applications. All these studies highlight the promise of artificial intelligence and complex algorithms in disaster response, but they also highlight the importance of ethical reasoning and human judgment. Lastly, Rodríguez-Espíndola et al. [19] say that Artificial Intelligence (AI) may significantly enhance decision-making processes in humanitarian supply chains by offering precise needs assessment, aiding prioritization, and enabling resource allocation.

Mobile Connectivity. To build robust communication networks for first responders in urban settings, Panitzek [17] investigates the possibilities of ad hoc and peer-to-peer communication and privately held wireless routers. Moreover, Lin [14] emphasizes how social media can improve citizen involvement and inclusion; however, Lin emphasizes the significance of local settings. Seyidov concentrates on the two-way interaction capabilities of platforms such as Twitter in creating a sense of community and connection. Falco [6] warns that despite these advantages, effective two-way interactions between governments and individuals on social media still face significant obstacles and constraints.

4. CONCLUSION

This comprehensive systematic review sought to provide an updated summary of pertinent studies conducted from 2010 to 2023 regarding the significance of technologies on transparency and humanitarian logistics efforts. This review study used PRISMA methodology to analysis the 50 peer-reviewed journal articles published since 2010. The review revealed one research stream on technologies in humanitarian logistics, examining its role and benefits in the field. The analysis identified several research areas for future exploration, including the use of emerging technologies such as blockchain and artificial intelligence to enhance transparency, the role of transparency in promoting sustainability and ethical practices, and the impact of technologies on the effectiveness of humanitarian interventions.

The findings indicated that, despite an expanding literature on technologies in humanitarian logistics services, empirical evidence is lacking concerning its practical implementation. The literature suggests emerging technologies can improve humanitarian efforts and make them more quickly and applicable.

Despite the valuable insights the literature provides, this review has several limitations. The sample size of 50 papers may not represent the entire field of humanitarian logistics, and the exclusion of non-English language publications may have resulted in a language bias. Additionally, the lack of standardized definitions and measures of technologies in the literature makes it difficult to compare and synthesize findings across studies. Hence, this systematic review contributes to a better understanding of technologies' role and potential benefits in humanitarian logistics while highlighting the need for further research to address

the challenges and limitations of achieving technologies in practice. Technologies and service delivery in the humanitarian sector are being impacted by innovations in tracking visibility, distributed ledger coordination, intelligent analytics, and mobile outreach. Nonetheless, maximum impact has been hampered by enduring skill, infrastructural, and design restrictions. These obstacles might be overcome with the support of participatory initiatives engaging beneficiaries and strategic alliances with technology companies.

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