Digitalization for Humanitarian Logistics

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Mismanagement in disaster relief operations (DROs) has created a requirement for fast, fair, and safe humanitarian logistics (HL). As a result, humanitarian logistics (HL) is the most imperative process after a disaster, and it is critical for fast, fair, and safe DROs.

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1. Introduction

The extent and frequency of a disaster's effects vary by victim, depending on their financial situation, the assistance they receive, and the level of experience of the individuals in the affected region. Natural and man-made disasters place tremendous demands on governmental and non-governmental organizations to provide relief. Countries must manage disaster losses more efficiently and proactively as the number of disasters increases [1]. As a result, humanitarian logistics (HL) is the most imperative process after a disaster, and it is critical for fast, fair, and safe disaster relief operations (DROs). The logistical contributions account for over 80% of the costs for all DROs [2]. Humanitarian organizations (HOs), on the other hand, have yet to identify or describe this fact. HL has the lowest ranking among HO priorities, even though it is a process that can determine whether DROs succeed or fail [3].

Mismanagement of resources has created a demand for effective HL to ensure it is fast, fair, and safe. Hence, both for-profit and nonprofit organizations engaged in DROs across the world face extensive pressure from donors and other stakeholders to provide fast, fair, and safe DROs in all aspects, especially HL [4]. In DROs, donors are considered significant stakeholders who hold substantial power over HL. Upon finding discrepancies in logistics, donors can stop funding organizations [3]. Digital solutions in the HL process hold great significance in ensuring fast, fair, and safe DROs, and in attracting government support and other independent donations [5].

Recent research (such as [6][7][8]), suggests that digitalization of HL can help improve fast, fair, and safe HL. Digitalization of HL refers to the use of technology-based solutions to track transitions of resources from warehouses to beneficiaries, and ensures a fast, fair, and safe process in resource distribution [9]. Digitalization offers the potential to assist in the efficient management of resources and in effectively tracing them. It helps to ensure accountability, security, trust, transparency, and promptness in the HL process [4].

Research on digitalization of the supply chain (SC) has a strong presence in contemporary literature; nevertheless, digitalization in the HL field has recently gained the attention of scholars [4][5][6][10][11]. However, it is still an under-

researched area, inviting further investigations in different contexts of HL. Digitalization as a general domain has been well explored in various disciplines from numerous perspectives. It has also been included as a moderating variable in several studies across various disciplines [5]. The impact of digitalization on logistics effectiveness, on the other hand, has not been largely investigated. As a result, the primary goal of this study is to offer a comprehensive picture of the need for HL digitalization, and to discuss how it might be accomplished.

2. Digitalization for Humanitarian Logistics

2.1. Humanitarian Logistics

Thomas and Kopczak [12] stated that HL is the process of planning, implementing, and controlling—in a cost efficient and effective way—the flow of goods, materials (right product) and relevant information from the origin point to the survivors location for consumption, thus meeting the beneficiaries' requirements (at the right place), (supply to right people and at right time) saving lives and helping vulnerable people, and improving infrastructure, assets, and protection [3]. Victims of a disaster immediately require life-saving aid, in which case HOs try to assist and save them [13]. The HL process is not a general one; it is extremely specific and related to life and death situations. All devastating effects of a disaster that need to be mitigated are of intense interest to disaster relief workers (DRWs) [14]. Contrary to other operations, in DROs, risk-taking is a common phenomenon and is fully appreciated by the victims as the main HL operations are brought quickly into the affected localities to minimize human suffering [15]. The key to effective HL is promptness, which is dependent on useful information. With the passage of time, and based on information from the disaster area, changes occur in relief distributions [16]; therefore, HL must be flexible and adaptable.

Zaw and Lim [17] reported that the most viable way to analyze fast, fair, and safe HL, with each actor participating in DROs, is centrality and perceived efficiency in the network in terms of contributions. HL performance can be compared in terms of fewer lives lost and people's lives devastated [18]. Information sharing, security, trust, and promptness in logistics further increase organizational effectiveness, which, in turn, increases capital (in terms of commercial organizations) and survivors (in terms of HOs). More specifically, when HOs better perform HL operations, the image of the organization is enhanced, which, in turn, leads to obtaining more funds from donors. Better management of donors also improves the organization's reputation [19]. The growing quantity and levels of catastrophes, material scarcity, the race for funding, and the obligation for accountability, together emphasize the significance of fast, fair, and safe HL [20]. Fair distribution of available resources, transparency and security [21], priority identification, and advanced technology, lead to fast, fair, and safe HL, which, in turn, leads to a positive influence on image building and donor funding of the HOs [3][22].

In response to major catastrophes, the volume of humanitarian aid has increased dramatically over the previous decade. Conflict and violence displaced over 82 million people globally by 2020 [23]. COVID-19 is set to become the most dangerous human infectious disease since the 1918 global influenza pandemic. It is also the worst public health crisis since World War II. It is unprecedented in terms of its complexity and difficulty, as well as its impact on the global economy and social development [24]. Disasters affect not only underdeveloped countries but also

developed countries; however, several recently observed disasters revealed that developing countries are often more helpless in a disaster situation than developed countries due to poor or non-existent infrastructure, urbanization, and population growth. They suffer from shortages of land, poor transportation infrastructure, limited numbers of HO vehicles, high fuel prices and consumption, aged and poor condition of vehicles, narrow road widths, and a low percentage of paved roads. Geographic characteristics, such as flooded or blocked roads, collapsed bridges, and a lack of trained pilots for air cargo via helicopter, are further impediments in already difficult situations [25].

In the HL process, of utmost consideration is the uncertainty and shortage of financing for DROs. Resource shortages during DROs are very common, which further increases nepotism, favoritism, and corruption, and decreases transparency [26]. The key factor that affects fast, fair, and safe HL processes, and that increases the vulnerability of the victims, is the substantial number of demands in an extremely short period. Similarly, already existing materials for help might have been demolished by the catastrophe, whereas outside supplies can be delayed due to destroyed or congested roads; therefore, in the response phase, effective HL is a big challenge for HOs trying to fulfill the uncertain demand in the first few days of a disaster. Likewise, in the response stage of a disaster (along with other issues), the health of the survivors is a big problem that requires immediate attention [3]. The risks and impacts of a disaster can be decreased depending on the digitalization of the organizations' HL.

2.2. Digitalization

Firms can use digitized data to improve present operations, but it also opens up new options for creating customer value [27]. Extant research and global organizations recommend adoption of digital solutions to track the flow of donations and resources from source to destination and to detect the flows in the system [28]. Thomas and Kopczak [12] stated that HL is the process of efficiently and effectively planning, organizing, executing, and controlling the flow of goods and materials (the right products). Appropriate information from the point of origin to the survivors' locations is needed to meet needs at the right time, and to supply goods and materials to the right people [3] to save lives and help the vulnerable [29]. The HL system of any state should be fair, secure, transparent, and fast to obtain practical results [30]. The issues of fairness, security, and transparency in relief aid are worldwide, because corruption and unfair practices have been recorded in numerous countries [31]. In recent years, HOs and government agencies have adopted blockchain technology (BCT) that makes logistics tamper-proof and highly transparent [32]. The blockchain technique holds electronic records in a tamper-resistant way, and users are only allowed to access, add, or observe relevant data [4]. The original information remains unmodified, which helps obtain an authentic chain of transactions. Organizations can utilize the software to connect all regional and local actors in HL through a single platform. In addition, digitalization can significantly improve the decision-making processes in DROs [5]. For instance, use of a spatial decision support system can effectively facilitate decision making in disaster management. In the context of Pakistan, digitalizing humanitarian aid is a challenging task for numerous reasons. The volunteers and government officials engaged in HL and DROs are not technically proficient in supporting and adopting digitalization in humanitarian work. Overall, HL faces a significant shortage of experts [33]. Moreover, an overall weak transparency structure and the culture of bribery and corruption require stringent controls and robust solutions [34]. In addition, the adoption and implementation of digital solutions to ensure

transparency in HL require substantial financial resources to hire experts and to develop the information systems that can track the movement of resources in the HL SC [5]. Limited financial resources are the main barrier to the adoption of digitalized HL for DROs in Pakistan.

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