Emerging Techniques for Enhancing the Performance of Humanitarian Logistics

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***Abstract*- Disaster risk can be mitigated through proper management. If disasters cannot be avoided, the suffering of the victims can be alleviated through efficient humanitarian logistics** (HL) **[1] and can be minimized through better management. The primary objective of this article is to supply humanitarian products and services in the most transparence, responsive and efficient way and to improve the situation better, faster and cheaper after a disaster strikes. This is a literature-based approach that extends emerging techniques applied in the area of humanitarian aid and HL in particular. A research model combining different variables is developed. Examples drawn from real-life cases and findings are discussed within the research model in order to develop hypotheses, and to recognize and provide areas for further research. This work proposes a post-disaster fast, fair and safe HL operational model that aims at disaster relief–service distribution to maximize fair distribution and survivor resilience. The framework links information technology (IT), monitoring, security, communication and transparency mediating by trust in humanitarian organizations (HOs) for effective HL. The interrelationships among these variables need to be understood in the development of effective HL. If HL is supported and valued, the effectiveness and predictability of humanitarian response will improve. Even small improvements in logistics efficiency will save many lives and reduce logistics costs. The paper is conceptual in nature; therefore, empirical research is needed to support the framework. The distinctive features of HL that are developed enable the framework to provide practitioners with a tool for planning and carrying out HL operations. The researchers have tried to reduce the risk of disaster through various aspects and angles. Unfair distribution is a worldwide phenomenon during HL.**

***Key Words*—** *Humanitarian Logistics; transparency; Performance; Information Technology; Monitoring; Security; Communication, Corruption; Donor; Performance*

1. Introduction

Disaster is a sudden devastating event that seriously disrupts the functioning of a population and leads to human, economic, material and environmental losses that are beyond the population's ability to control by applying its own resources [2]. Various kinds of increasing emergency circumstances put humans at risk [3]. Disaster can be defined as a situation of crises when a deadly event occurs unexpectedly, leading to human suffering [3]. Characteristics of natural disasters are uncertainty, emergency, dynamism, complexity [4], sudden occurrence, demand for quick reaction, stressful situation, threats to the organizational reputation and rises in intensity. The activities of disasters are mitigation, reduction of risk, prevention, preparedness, response and recovery [3]. Vulnerability is one of the main measurements to determine the disaster intensity [5]. In recent decades, both natural and manmade disasters have severely affected nations and communities [5]. Due to the increase in the intensity and frequency in the last decade the average number of fatalities has risen sharply [3]. Across the world from environmental disaster in 2010, 207 million people suffered, with 296,800 deaths and losses in the order of 109 billion US$ [1]. The forecasts claim that trend of disaster will continue and the number and severity will increase 5-fold in the coming 50 years [5]. To help people during this difficult time of disaster involves many actors such as non-governmental organizations (NGOs), local, state and agencies of federal governments, faith- and private-based organizations [6]. HOs can be categorized as UN organizations working, international organizations and NGOs [7]. These organizations provide food, water, medical assistance, and shelter. Uncoordinated cooperation among these organizations creates some challenges [6]. The purpose of coordination throughout the supply chain (SC) is to assist victims. Owing to globalization, disasters effect is not only on the concern, county but also effects other country around the world similar to financial crises, which affect countries worldwide. Therefore, all stakeholders have to work in a coordinated manner to control the situation [8]. Along with assets, environmental disasters also affect the emotional stability of people, so even when disasters are unavoidable, the suffering of the victims can be alleviated through efficient humanitarian logistics (HL) [1] and can be minimized through better management. Therefore, a disaster situation requires proper planning, guided response and proper efforts of coordination throughout the disaster lifecycle [3]. Unfair distribution is a worldwide phenomenon, such as US Hurricane Katrina, the 2010 and 2014 floods in Pakistan, the 1996-2006 civil war in Nepal, and the 2008 Wenchuan earthquake in China. The range of claims ranges from unequal unfair allotment of temporary houses to political groups to misappropriation of relief funds [9]. To tackle natural disasters properly, researchers required to develop a framework for HL [4].

Disaster risks, challenges and issues have been discussed and solutions proposed through various

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approaches. However, this article provides a unique conceptual framework through a different angle, which is the development of effective HL through the linkage and combination of information technology (IT), monitoring, security, communication and transparency mediating by trust in HOs. The importance and interrelationships among these variables need to be understood in the development of effective HL. This article makes three distinct contributions. First, we thoroughly examine the literature regarding the impact of these variables on HL performance. Through this conceptual framework, we find challenges and the mediating effect of trust in HOs. To the best of our knowledge, this conceptual framework has not used in examining the relationships among these variables in the HL field. Second, the findings from the review are beneficial for all stakeholders, especially donors, HOs and governments as they are persistently seeking strategies to assist victims and develop an affective HL framework. Third, the structure of this conceptual framework leads to recognition of research gaps and promising areas for further research.

The rest of the paper is organized as follows. The paper starts with a literature review, which lays the base for a description of HL. Next, the paper discusses the proposed theoretical model. It concludes with a framework for HL in disaster relief. The concluding discussion also recommends the types of further research needed in this field.

2. Literature Review

2.1. Humanitarian Logistics (HL)

Logistics is the critical phase in humanitarian operations [10]. "HL is the process of planning, implementation and control efficiently, focus on low cost flow and storage of goods and materials, as well as related information, from point of origin to point of consumption for the purpose of relieving the suffering of vulnerable people" [1], [11]. Its role encompasses a range of activities, including the planning, preparation, transportation, acquisition, storage, monitoring and tracking [1], [11]. HL is defined as the performance of the combination of activities before, during and after a catastrophe in order to diminish its impact [2]. The primary objective of HL is to provide human basic needs, to reduce human suffering, to supply humanitarian products and services in the most responsive and efficient way [12], to mitigate and prepare against disasters occurrence and to improve the situation better, faster and cheaper [13]. HL covers all the activities of logistics from the phases of preparedness to recovery [12]. The basic activities of HL are the delivery of proper goods, to the right people, at the right time, place and quantity [10], while simultaneously analyzing relief needs, emergency rescue situations preparation, inventory and team management, organized relief items and last-mile distribution planning [13]. The main characteristics of HL are the principles of neutrality, humanity and impartiality, along with efficiency and effectiveness in a dynamic suffering environment funded through donors funds [14]. Lead-time prediction is difficult and the available lead-time is always very short [12]. Some additional challenges that may occur include transportation, communication, infrastructure, decentralized nature of the operation and hostile environment. HL mostly requires dynamic approach, different resources, and different structure of logistics and mission. HL provides relief to the victims following a disaster in which effectiveness, efficiency and speed is the key. Approximately 80% of logistics cost in relief operations (RO) is incurred in transportation and procurement [15]. HL efficiency and effectiveness during RO affect the overall performance of the HOs. Therefore, HL is the planning, implementing and controlling process of the cost effective and efficient flow of materials, goods and relevant information from the origin to the point of consumption for meeting the beneficiaries' requirements. Efficiency and productivities in HL are challenging issues with increased significance in humanitarian operations due to the pressure from donors on HOs to deliver relief in a cost effective way to beneficiaries [16].

2.2. Performance in humanitarian logistics (HL)

Due to the central role of logistics in relief operations, the effectiveness and efficiency of HL are important indicators of relief performance [7]. The cost and activities of HL is about 80% of RO. Time is money but in the case of HL, time is life [17]. The basic factor in HL following a disaster is the performance and perception about the performance of HOs [10]. The key issue for HL is the actual performance delivered and the perception built by media after a disaster. The actual outcome of HL following a disaster is of interest to governments and donors [10]. Yet most organizations continue to underestimate the importance of HL and still focus on activities of fundraising only [18]. In fact, HL strongly requires efficiency in the location of resources, cost minimization and rapidity in distribution. More specifically, the fair sharing of available resources among the victims is of paramount importance [19]. Performance measurement is the key for improvement in HL to inform decision making, increase communication among stakeholders, increase transparency, track staff performance and transfer appropriate information, which further increase the flow of funds [15]. Making overambitious strategies to impress international donors and other stakeholders instead of focusing on victims leads to a lack of overall performance of the organization. Even if the funds are generously donated by international donors, the strategy must be victims oriented instead of donors by HL [20]. HL performance is considered in resources, processes and capabilities, and the most basic requirements of beneficiaries are survivability, speed, safety and sustainability. A gap is considered to be unsatisfactory performance. Other factors such as the government trend toward humanitarian operations, line and order situation, and country corruption level influence the performance and operational decision of HL [21]. The performance of HL can be improved through coordination. At high HL performance, the priority is known and more beneficiaries are covered quickly with limited resources [21]. For effective response, HOs must have expert logisticians [17], appropriate flows of

communication and information and available lines of funding [22]. HOs receive donations and deliver to victims through HL. Higher HL efficiency will help more beneficiaries. Pressure from donors on HOs, who demand information about the impact and performance of the organizations, along with provision of general information from the organization, improves HL transparency and accountability, which may further improve the ethical Excellency and direction of the logisticians. Quick response, which is the main goal of HL, can be achieved through highly motivated staffs [23]. A lack of expert logisticians strongly affects the performance of HL [17]. HL is vital to aid relief for several reasons. The speed and effectiveness of RO is linked with HL. The program will fail if logistics do not support delivery at the right time and place. Logistics is one of the most expensive and critical parts in RO. The main purpose of HL is to coordinate and plan all those important activities to gain desired levels of quality and service. Assessment, security, IT and telecommunications, recruitment and asset management are vital tools in planning for relief activities. Assessment enables organizations to make sure that the right product reaches at the right time to the right beneficiaries at lower cost [24].

In natural disasters, efficiency is the measured by quick response to the affected. The most important aspect in HL is the proper and efficient utilization of resources; otherwise, the donors may stop donations [1]. Humanitarian sector performance measurement mostly focuses on making certain transparency and accurate stewardship of funds [15]. The behavior of donors, shortage of funds and spending of available funds in a short time period strongly affect the performance of HL. [17]. Recently, the attention on effectiveness in HL has increased and the pressure from donors on HOs has also increased to ensure that pledge relief and resources are reaching quickly those in need, which further improves the performance of HL [25].

2.3. Donations

HL is influenced by the availability of funds from donors, which further influence the beneficiaries' requirements and performance [21]. To fulfill the objectives of stakeholders during HL, the funds must be flexible, predictable and timely. On the contrary, a lack of funding creates severe constraints for HOs in an environment where there are multi-objectives, stakeholders, unpredictability, uncertainty and urgency of response. Proper allocation of funding can increase efficiency, cost saving and cover more beneficiaries. Timing and promise of donation funds are very crucial for all stakeholders. The main focus of donors is on whom to donate to and of HOs is on how to allocate the resources received [14]. Funds transfer mechanisms from donors to HOs must be developed for quick response and to cover last-mile distribution [15]. There is tough competition among NGOs belonging to similar localities and sectors. Therefore, fundraising efforts are also increasing day by day. The donors want to know the allocation of their funds and to understand the virtual effect of their donation but too much information can frustrate and confuse the donors [26]. In a more positive development, donors consistently insist on receiving detailed plans from HOs they fund, which encourages HOs to plan more strategically by fulfilling their objectives, impact, activities and output. This further improves the performance of the HOs and covers more beneficiaries cheaper and faster instead of duplicating efforts or mismanaging resources [22]. Because of the increasing number of natural disasters, donors put pressure on HOs to cover more beneficiaries with appropriate cost, and short time [15]. If the performance and utilization of resources of any organization are poor, the donors may discontinue funding [7]. The expectation of donors regarding the use of donations differs according to the type of donor, and donations come from donors scattered worldwide [1]. Assisting vulnerable people after a disaster strikes often starts within the humanitarian supply chain (HSC), but the real driving forces behind the HSC are the donors. Therefore, the organizations involved in RO are accountable to the donors. So the donors consider customers to be satisfied in case of RO [8].

2.4. Corruption

Donations for the purpose of disasters relief are worth as much as $10 billion annually [27], funded and delivered through a mosaic of donor organizations, such as UN organizations, international organizations, NGOs and military forces. These actors work according to various guidelines and norms, but differ considerably in approach and degree of consistency. Each actor of this SC creates risks of diversion, mismanagement and corruption, and reduced assistance to vulnerable people. As recorded sexual exploitation scandals have demonstrated, that there are not only financial corruption but also moral corruption and abuse of right. A series of corruption opportunities arises in HL during decision processes. The recipients of relief are mostly vulnerable to exploitation, such as payment demands from victims to be included on registration lists. The time pressures of relief, large-scale of the procurement processes, speedy recruitment and spectacularly budget expansion all raise further risks of corruption [27]. Some governments are very corrupt and people only focus on money and not on the real situation. Local elites control the list of beneficiaries, agency staff seek bribes from beneficiaries, the elites' homes are used as a distribution hub, denying, falsifying monitoring, reporting and evaluating to hide valid corruption evidence are common in the field of HL [28]. Corruption can be eliminated in the roots of the country's ruling source; therefore, society will not refer to heads of the country when it is indicted of being corrupt. Society may not be expected to follow laws of anti-corruption if the government itself is a better example of it [29].

The staff should be educated that corruption is not limited to fraud in financial practice, kickbacks, falsified expense reports, but also includes sexual exploitation, nepotism, abuse of right to force or intimidate of HL staff or goods recipients for personal, political or social gain, favoring a particular group, and covering of non-target

groups. The most common form of corruption is favoritism, selecting a person for jobs from one's own group not on merit but on personal relationship. During cash or aid distribution, the community committee adds the name of his/her own well-wishers to the recipient lists. However, in some cultures favoritism and nepotism are considered a common expression of social reciprocity and solidarity and not of corruption. HOs sometimes pay bribes at port to speed the delivery of aid. Traditional leaders and armed groups also have some power and have humanitarian responsibilities and may abuse their power. Generally, corruption prevention during RO is perceived as just another routine part of business. On the other hand, corruption during response RO may lead to failure of the HL mission, create security risks and bad image of the organization, especially with the beneficiaries and donors, and damage staff morale and organizational culture. Bribes to the traditional leaders or to the local community to remain quiet about poor quality construction and bribes in the allotting of houses to the victims are issues at the rehabilitation stage of the disaster. Excessive focus on corruption during RO will slow down the response of HL; therefore, priority should be given to the speed of logistic and not to the prevention of corruption during the life saving phase of operation. The corruption trend is stronger in headquarters than in the field and ranges from bank accounts, payroll, exchange rate, collusion and receipts falsification. The corruption in transportation includes personal use of vehicles, vehicles being hired out, fuel siphoned, falsified records, collusion with fuel providers and unnecessary repairs and/or overpayment for repairs. Some organizations unload trucks at night so that the public will not notice the warehouse [30].

3. Conceptual Model and Hypotheses

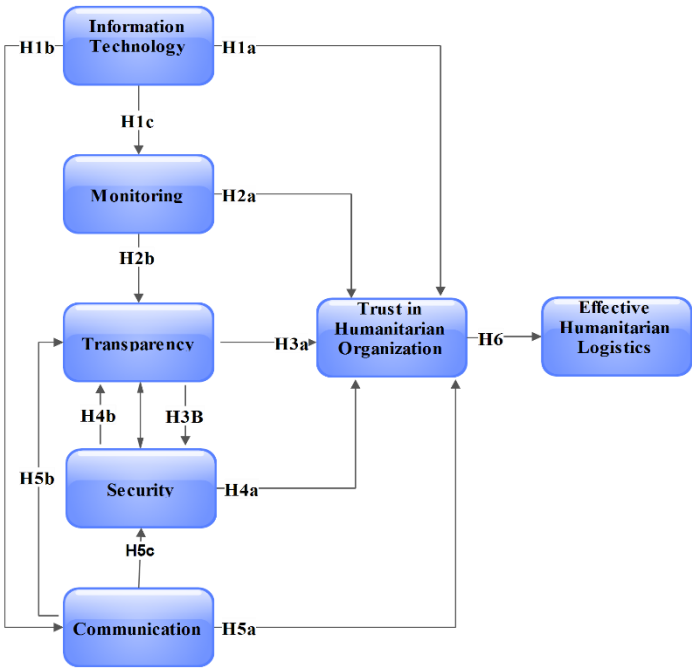

Figure 1. Theoretical Framework

3.1. Information Technology (IT)

Relief organizations mostly have program and support services activities and they focus on direct short-term relief instead of on investing in processes and systems for reducing expenses or for efficient HL in the long term. Most HOs do not have sufficient funds, especially for information systems [24]. Very few HOs have tracking and tracing software. Lack of capability of IT staffs in turn, create many problems in HL. Comparing data from the 2004 Indian Ocean tsunami to data from the 2006 Jakarta office revealed HL software was effective in increasing HL efficiency. The SC fixed time decreased from 18 days to 3 days, the cost to deliver aid per family reduced from 800 US$ to 142 US$ [24]. IT will enhance mutual trust among those involved in relief work and further improve the performance of future relief activities [8]. Some software in logistics is also used for monitoring, tracking and reporting purpose for improving performance [25]. When a disaster strikes, existing distribution and transportation systems are often unprepared and/or destroyed and IT is inadequate [12]. IT enhances performance through information sharing, flexibility, agility, collaboration and coordination among the players during RO [8]. Accordingly, the following hypotheses are postulated.

H1a: *IT will enhance trust in HOs.*
H1b: *IT will help to increase communication among relief players.*
H1c: *IT will increase the level of transparency.*

3.2. Monitoring

The main problem in transparency is a lack of monitoring, which calls for higher transparency of humanitarian operations but the lack of monitoring whether requirements of the victims are being met or not [31]. For fair distribution of donated funds, governments should strengthen federal and provincial institutions through clear guidelines monitoring, and evaluating the flow and implementation of funds. The donors can be convinced through results, monitoring, evaluation and measurement [32]. The effects of performance measurement further improve transparency and accountability. Stakeholders' accountability can be demonstrated due to learning from documentation and experiences. In HL performance management, the most important actors are the donors, and they want to monitor the level to which their resources are well spent [15]. The Fritz Institute reported that due to monitoring and managing system lapses in HL in the 2004 tsunami, the relief aids in Southeast Asia led to large-scale shortages of relief items [33]. Better programming quality, complaints handling mechanisms, regular monitoring of recipient satisfaction, accountability and transparency can mitigate the risk of corruption [30]. Therefore, we posit the following hypotheses.

H2^a: *If there is monitoring there will be trust in HOs during HL.*
H2^b: *If there is monitoring there will be real transparency.*

3.3. Transparency

The increasing number and magnitude of disasters, the shortage of resources, the funding competition and the requirement for accountability need effective, efficient and transparent HL [10]. Transparent policies have numerous advantages. First, transparency facilitates the process of decision making of HL by alleviating problems pertaining to insufficient information, uncertainty and lack of accountability. Transparency is also the main tool in fighting corruption. Lack of transparency helps arbitrariness and facilitates the hiding of bribery. Second, lack of transparency imposes additional information cost. Third, transparent policies facilitate partnership among HOs [34].

After a disaster strikes, most HOs concentrate on fundraising but not on spending funds efficiently [14]. For future funding and for image building, HOs need to be transparent, accountable and have to allocate funds where donors want them to be allocated. Through accountability and performance measurement, efficiency and transparency can be enhanced, which further have a positive effect on donors and on HL. Donors not only provide funds but also incentives to HL and put pressure with respect to accountability and transparency. Therefore detailed research is needed on transparency in HL [14]. Transparency and improved coordination along SC is a common theme, and guarantees decreased vulnerabilities, which allows the SC to deal with growing threats without sacrificing efficiency [35]. Lack of transparency and accountability strongly affects the performance of HL [17]. Value creation, communication and transparency further improve efficiency and effectiveness [13]. A performance measurement system increases transparency and accountability of HL. In HL, the key for success is the capture of accurate information effectively and efficiently, which is crucial for donors to develop policies related to the release of funds [15]. The best protection against breach of rights in HL is to make sure that regulatory measures are enforced fairly by the HOs [5]. In order to decide among conflicting mandates and goals, lack of transparency is a major issue in HL. Donors want HOs to be more visible, transparent, accountable and efficient to provide value for money, and to apply visible metrics of performance in their SC [12]. Removing the taboo of corruption in HL and developing transparency can be achieved by increasing staff incentives and establishing effective and safe complaint mechanisms [30]. As competition for resources becomes tighter, HOs face increasing pressures for greater accountability from donors. As the frequency and scale of disasters increase, competition for funding and accountability require more effective, efficient and transparent RO. Effective systems of performance measurement will assist logicians in their decisions, improve the operation efficiency and effectiveness, demonstrate the performance of the relief chain and increase the accountability and transparency of disaster response. Fair supply distribution is an indicator of effectiveness for the relief chain [7]. Nowadays, HOs face greater demands from the public and donors for transparency and accountability [36]. Increasing pressure on HOs to be transparent instead of fulfilling the population needs reduces performance [31]. Accountability and transparency have been studied in different logistics settings. Fairness, efficiency and efficacy are very important for optimizing the logistical model. Routing and aid delivery must be measured for transparency. The public equitable allocation of resources log measurement method could improve fairness and performance, further increase transparency and accountability in the concerned sector and also assess how the organization sector completed their task and how funds have been used [37]. The main goal of performance measurement is to advance continuous improvement and to create transparency, which further improve the efficiency and effectiveness of HL. Transparency and a high degree of performance development can become part of a unique promotion proposition to donors [38]. The unfair distribution of funds during HL affects a substantial part of the population affected by disaster. Income equality occurs through fair distribution [9]. Transparency can induce trust between the population and HOs and reduce different malpractices and corruption [31]. Developing effective and efficient performance of HL requires transparency [28]. Corruption or lack of transparency during response RO may lead to security risks [30], and can lead to failure of the HL mission. For example, security can reduce terrorists' attacks by limiting unauthorized access to a vehicle. Transparency, trust and commitment between partner organizations depend on the security and culture of the organizations [35]. Accordingly, we postulate the following hypotheses.

H3^a: *If there is transparency there will be trust in HOs.*
H3^b: *Transparency will decrease security threats.*

3.4. Security

Security refers to confidence in the business continuity and the prevention of undesirable events, such as terrorism, damage, theft, sabotage, crime, protecting product, equipment, facilities and personal, preventing the disclosure into the SC of unauthorized people, smuggling, or mass destruction of weapons. Three main reasons to improve and to invest in HL security are improvements in efficiency, response and resilience [35]. The security situation of the country strongly affects the HL performance [17], [21]. In response to security risk during logistics and transportation, numerous strategies have been implemented to cope it. The highest security threat might come from containerization, hijacking, the use of hazards and hijacking materials for cruel purpose. SC security leads to continuity and efficiency along with additional security costs. Nevertheless, the cost and efficiency of security of HL have to be balanced. Making HL more secure requires the implementation of proposed organizational and technical solutions and security measurement. The major drivers of SC security are greater risk perception, brand criminality, protection requirements of customers, pressure of competition, and pressure from

customers and governments. Lack of HL security leads to vulnerabilities. The basic goal of HL security measurement is to prevent and detect crime or to recover from a crime, while crime of HL includes smuggling, theft, counterfeiting, blackmailing, sabotage, terrorism, fraud and corruption. The main purpose of security is to reduce the likelihood of a terrorist attack by reducing unauthorized access to transport vehicles and making logistics more transparent. Security measures need technology investment, personnel, planning of security, security of physical facilities and regularity of compliance in real time to improve efficiency and processes rather than to increase cost [35]. Coexistence of cooperation leads to coordination. Coexistence is the sharing of minimum necessary information between civil institutions and military forces. This generally includes information sharing information related to security and transportation movement [22]. Corruption during response RO may lead to failure of the HL mission and may create security risks [30]. To work in an efficient and coordinated manner provides maximum relief and security to the victims [39]. Organizational culture security between partners in the SC might impact the commitment and trust in HOs. Transparency, trust and commitment between partner organizations depend on the security and culture of both organizations [35]. Thus we hypothesize as follows.

H4a: *Better security situation will increase trust in HOs.*
H4b: *Better security situation will ease the process of transparency.*

3.5. Communication

The issues of communication are of critical significance in HL. Upon the sudden onset of disaster, the need to act quickly is crucial. But numerous untrained and uncoordinated logisticians with a lack of information can result in awful inefficiencies, delays and duplicated efforts that lead to material resources wastage and critically increase the number of fatalities [40]. Major disasters need rapid responses from many organizations. That involves broad communication about the availability of resources, specific needs packaging and optimal size of goods and timing and location of deliveries. Faster, accurate communication within the affected area means more effective response at the disaster site. In HL, many decisions have to be made under urgent time constraints with complexity ranging from a sole fact to a tangle of inaccurate information. Some researchers have acknowledged that the pair-wise transfer of information in HL has not usually been a focus of research on communication. In HL, communication becomes vital because decision makers may be trying to exchange information quickly with multiple stakeholders and time consumed in one communication reduces the time available for other communications. Effective HL response depends on communication [41]. Some further studies related to communications in disaster response have focused on the use of diverse types of communication among the stakeholders, but these differ from the focus and design of the present study.

Language and communication are obstacles in the way of performance. Therefore, neutral language should be applied during RO, which leads to further improvement by avoiding mistrust and misperceptions [22]. Proper communication skills are required for logisticians to enhance the happiness or diminish the misery of victims. Internal aspect of the organization, such as physical space, experience, information presentation, funding, available resources, and information, should be considered before commencing any reconstruction project [5]. Within an ad hoc and dynamic environment, emergency management involves wide communication, coordination and integration. Coordination is required to attain real time knowledge and information during HL. To save lives and property, HL efforts need timely communication, information and the application of related knowledge [3]. Due to a lack of information throughout the logistical process, accountability and transparency in HL are low. In order to manage conflicting mandates and goals and to overcome a lack of willingness of information sharing, collaboration and coordination among HOs involved in HL is a major issue. Collaboration can help organizations share information and experiences that will further future activities of coordination [12]. Karunasena, G. and D. Amaratunga, [42] also reported that communication and coordination are necessary in improving the transparency of HL. This will also encourage the adoption of advanced IT systems in the disaster management process [42]. Therefore, we propose the following hypotheses.

H5a: *Better communication will increase trust in HOs.*
H5b: *Proper communication will increase transparency in HL.*
H5c: *Better communication will properly deal with security issues in the affected area.*

3.6. Trust in Humanitarian Organizations (HOs)

Recent decades have witnessed increasing complexity and impacts of disasters. Disaster operations usually include multiple stakeholders such as donors, host governments, commercial enterprises, the military and local communities working for effective response. Trust in HOs plays a key role in the success of any emergency operation. Trust is a basic concept in supply chain management and has been studied from a range of perspectives, such as psychological, sociological and economic. Studies on trust formed in disaster RO on sudden onset disasters are scant. Trust has been loosely defined as "confidence in an exchange partner's integrity and reliability" [43]. In this study, we mainly discuss trust in organization by stakeholders. By building trust in organizations, donors can provide funds which further improve their logistics operations smoothly and effectively, which in turn may reduce the HL operating cost and alleviate the sufferings of the beneficiaries.

The lack of trust and cultural differences among the actors strongly affect the performance of HL. The key for coordination among actors is trust. Once trust occurs among actors, there will be coordination, information and resourcing sharing, learning and a participative environment and finally

an expression of views and opinions freely that can enhance the performance of HL to a high level [17]. Cooperation and coordination lead to reciprocity, equity and trust, which further improve HL performance. Information sharing and trust can increase the performance of HL. The bridge between relationships is trust in HOs, which further induces reliable and long-term collaborative partnerships. The distribution of food and water, information sharing, support refugees and evacuation by local communities are always appreciated. Conventional HL has also been observed to increase trust and give legitimacy that improves performance [31]. Challenges of power and trust also hindered cooperation [26]. The corruption report undermines public trust, which is very sensitive for HOs because most HOs raise funds from public appeals. Therefore, HOs take this issue more seriously than other issues in the industry [30]. Coordination can be established through mutual trust, which is the expectation of a firm from other firms regarding the sharing of information, responsibility and moral values. Mutual trust can be considered a linking force in establishing relationship and it improves the quality of information (in terms of accuracy, timeliness and openness) shared between organizations. To improve the transparency of the current systems, communication and mutual trust are very important [8]. Trust among inhabitants is stronger in neighborhoods where HOs are continuously working and exchanging information [44]. Therefore, we propose the following hypotheses.

H6: *If trust is built during HL, the organization will get more funds, which will further improve the performance of HL.*

Table I. Summary of referenced studies of the theoretical model and hypotheses

S/No	Important Study	Context	Key Findings
1	[27]	Managing the risks of corruption in humanitarian relief operations	Each actor of this supply chain creates risks of diversion, mismanagement and corruption, reducing the assistance of vulnerable people.
2	[8]	Information Technology and Mutual Trust	IT will enhance the mutual trust among those involved in relief work and further improve information sharing and performance of future relief activities.
3	[24].	Advocacy to promote logistics in humanitarian aid	Very little HOs have the tracking and tracing software which may decrease the performance of HL.
4	[31]	From disaster to development	The main problem in the transparency is lack of monitoring, call for higher transparency of humanitarian operation but lack of monitoring whether requirements of the victims are being met or not.
5	[15]	Managing the risks of corruption in humanitarian relief operations	The performance of HL can be enhanced through interaction and satisfaction of donors and to improve accountability and transparency of HOs toward their stakeholders.
6	[30]	Preventing Corruption in Humanitarian Assistance	Better quality of programming, complaints handling mechanisms, regular monitoring of recipient satisfaction, accountability and transparency can mitigate the risk of corruption.
7	[14]	The funding—Humanitarian supply chain interface	For future funding and for image building, HOs need to be transparent, accountable and have to allocate funds where donors want to be allocated.
8	[17]	Identification and prioritization in HSCM	Lack of transparency and accountability is highly effect the performance of HL.
9	[30]	Preventing Corruption in Humanitarian Assistance	The corruption report undermines public trust, which is very sensitive for HOs because most of the HOs raise funds from appeals to the public. Transparency, trust and commitment between partner organizations depend on the security and culture of both the organizations
10	[21]	A meta-analysis of HL research	Security situation of the country strongly affects the HL performance.
11	[35]	Emergence of security	Transparency, trust and commitment between partner organizations depend on the security and culture of both the organizations.
12	[40]	Communication effects in disaster response logistic	Communication issues are crucial in HL.
13	[41]	Quantifying communication effects in disaster response logistics	Faster, accurate communication within the affected area means to more effective response at the site of disaster.
14	[42]	Capacity building for post disaster construction	Communication and coordination are necessary in improving the transparency of HL.
15	[3]	Knowledge management systems in support of disasters management	To save lives and property HL efforts need timely communication, information and applying related knowledge.
16	[43]	Trust in humanitarian logistics operations	It is well documented that a high level of trust among SC partner organizations leads to better chain performance in humanitarian contexts.

4. Discussion

By targeting the proper distribution of relief items through enhanced transparency, this work proposes a conceptual model which examines post-disaster relationships of IT, monitoring, security and communication. All of these variables are mediated by trust in HOs and may have a positive effect on HL. In addition, this work proposes a post-disaster fast, fair and safe HL operational model that aims at disaster relief–service distribution to maximize fair distribution and survivor resilience. Undoubtedly, the present HL system does not perform well. Nevertheless, there are numerous opportunities for future research in the area of HL. From the perspective of novelty and academic contribution, it is one of a few theoretical investigations in the area of HL, and may contribute to future rigorous empirical examination in the field.

First, most HOs have programs and support services activities and they focus on direct short-term relief instead of

on investing in processes and systems for reducing expenses or for efficient HL in the long term. Most HOs do not have sufficient funds, especially for information systems. IT may enhance the mutual trust among those involved in relief work and further improve the performance of future relief activities. Therefore future research needs to explore the importance and implementation of IT during HL.

Second, the main problem in transparency is a lack of monitoring, which calls for higher transparency of RO but the lack of proper monitoring. For fair distribution of donated funds, governments should strengthen federal and provincial institutions through clear guidelines monitoring, and evaluating the flow and implementation of funds. The donors can be convinced through results, monitoring, evaluation and measurement. The performance of HL can be enhanced through increased interaction and satisfaction of donors and through improved accountability and transparency of HOs toward their stakeholders. Better quality of programming, complaints handling mechanisms, regular monitoring of recipient satisfaction, accountability and transparency can mitigate the risk of corruption. Therefore, this area could be empirically explored further.

Third, the increasing number and magnitude of disasters, the shortage of resources, the funding competition and requirement for accountability necessitate effective, efficient and transparent HL. Transparency is also the main tool in fighting corruption. Lack of transparency helps arbitrariness and facilitates the hiding of bribery. Transparency and improved coordination along SC is a common theme, and guarantees decreased vulnerabilities, which allows the SC to deal with growing threats without sacrificing efficiency [35]. Lack of transparency and accountability strongly affects the performance of HL [17]. Value creation, communication and transparency further improve efficiency and effectiveness. Nowadays, HOs face greater demands from the public and donors on transparency and accountability [36]. Developing effective and efficient performance of HL requires transparency [28]. Therefore, detailed research is suggested on transparency in HL.

Fourth, the main reasons to improve and invest in HL security are improvements in efficiency, response and resilience [35]. The security situation of a country strongly affects the HL performance [21], [17]. The basic goal of HL security measurement is to prevent and detect crime or to recover from a crime, while crime of HL includes smuggling, theft, counterfeiting, blackmailing, sabotage, terrorism, fraud and corruption. Therefore, security along with transparency needs to be analyzed further considering HL.

Fifth, faster and more accurate communication within the affected area means more effective response at the disaster site. Some researchers have acknowledged that the pairwise transfer of information in HL has not usually been a focus of research on communication. In HL, communication becomes vital because decision makers may be trying to exchange information quickly with multiple stakeholders and time consumed in one communication reduces the time available for other communications. Effective HL response depends on communication. Communication is necessary to improve the transparency of HL. This will also encourage the adoption of advanced IT systems in the disaster management process [41]. Due to lack of information throughout the logistical process, accountability and transparency in HL are low. Therefore, this area needs to be further discussed by considering transparency, trust and IT.

Sixth, trust in HOs plays a key role in the success of any emergency operation. By building trust in organizations, donors can provide funds which further improve their logistics operations smoothly and effectively, which in turn may reduce the HL operating cost and alleviate the sufferings of the beneficiaries. The key for coordination among actors is trust. Once trust occurs among actors, there will be coordination, information and resourcing sharing, learning and a participative environment and finally an expression of views and opinions freely that can enhance the performance of HL to a high level [17]. The corruption report undermines public trust, which is very sensitive for HOs because most HOs raise funds from public appeals. Therefore, HOs take this issue more seriously than other issues in the industry [30]. But unfortunately studies on trust formed in the disaster RO of sudden onset disasters are scant. Therefore, researchers should further analyze this area.

5. Conclusion

The primary objective of this article is to supply humanitarian products and services in the most transparent, responsive and efficient way and to improve the situation better, faster and cheaper after a disaster strikes. This study investigated the antecedents of enhanced transparency, IT, monitoring, security and communication, and develops a framework linking trust in HOs which can further improve the effectiveness of HL performance. IT will enhance mutual trust among those involved in relief work and further improve the performance of future relief activities Lack of capability of IT staffs in turn, create many problems in HL. The security situation of the country strongly affects the HL performance. Faster, accurate communication within the affected area means more effective response at the disaster site. Trust in HOs plays a key role in the success of any HL operation. The donors can be convinced through results, monitoring, evaluation and measurement. For future funding and for image building, HOs need to be transparent, accountable and have to allocate funds where donors want them to be allocated. To fulfill the objectives of stakeholders during HL, the funds must be flexible, predictable and timely. On the contrary, a lack of funding creates severe constraints for HOs in an environment where there are multi-objectives, stakeholders, unpredictability, uncertainty and urgency of response. Proper and transparent allocation of funding can increase efficiency, saving cost and cover more beneficiaries. The theoretical framework proposed in this study sets a research agenda for academics.

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