

## Effective and Efficient Relief Supply Chain Management: A Case Study of Flood Relief-2022 in Sindh

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### ABSTRACT

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In the backdrop of recent floods in Pakistan, this study focuses to identify the challenges faced in the aid distribution supply chain and envision best practices from Business Supply Chains for use across the relief projects. The argument is that relevant aspects of business supply chain can be applied for operational efficiency of relief supply chain. Using a mixed method approach, seven organizations based in Karachi were selected using purposive sampling method and data was collected using questionnaire having both open and closed ended questions. The quantitative data was analyzed using Microsoft excel and qualitative data was analyzed by thematic analysis. The findings of the study show that all the stakeholders agreed that coordination and collaboration in relief work can increase the effectiveness. The main challenges faced by them were inadequate financial resources, accessing the affected areas, duplication of the relief operation in same areas, as some of the areas got the attention of all relief actors while others got missed at a given time. The research suggests that by adapting CPFR model, Collaborative Planning, Forecasting and Replenishment in the supply chain approach, combined effort and practices can increase the efficiency and effectiveness of relief work.

**Key Words**

Flood, Supply Chain, management, Collaborative planning  
Efficient, Replenishment

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### Introduction

Torrential monsoon rains have left huge challenges for Pakistan related to economic and social sectors as well as for the environment and sustainable livelihood. The situation is alarming as the Global Climate Risk Index-2021 rank includes it in top ten countries affected by climate change. Due to high climate risk, the vulnerability to disasters will be increased in future putting a high pressure on average annual losses (ADB,2021). This includes health related risks, increase in poverty gender inequality and migration. An assessment of total economic loss due to floods in 2022 is about USD 15.2 billion and for reconstruction and

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rehabilitation the requirement is estimated to USD 16.3 billion (World Bank, 2022). Although the flood affected large parts of Baluchistan, Khyber Pakhtunkhwa, and Southern Punjab, however in Sindh, 75 percent of its area became flooded leaving roads and villages under water for more than two months (Vaidyanathan, 2022). International community and Our government, local organizations are doing its level best to help those that have been affected by the disasters, however it seems that the situation requires long term planning for effective and efficient relief work as well as sustainable solutions for the future. To properly handle and distribute the relief materials to victims, different stakeholders must work together. These include government, the military, the humanitarian organizations, and the members from community (Tatham & Spens, 2015). This study focus on why should and how could humanitarian organizations cooperate with each other in disaster relief. Usually, in relief efforts the responsiveness is the main emphasis, efficiency and effectiveness are often secondary. Due to which the overall efforts of the relief often unsuccessful to achieve the degree of sustainable outcome. This research argues that the major foci of business supply chain is responsiveness, extensive collaboration within the firms' departments and among the firms, establishing visibility through sharing information that builds trust, effectiveness and efficiency and it can be used to accomplish the gradual restoration of normality.

From mid-June to September this year, Pakistan was hit by torrential monsoon rains that caused flash floods and standing water, killing people and livestock, and causing widespread damage to house and overall infrastructure. Even though flood water level is reduced at many locations, substantial portions of eastern Baluchistan and Sindh are still submerged and are likely to remain so for several months. The flood water has become a risk of diarrheal diseases. The roads are flooded, and people pushed to take shelter in the relief camps. Several houses have been damaged and school and health facilities eroded. More than 5000 relief camps are setup in schools for the time being. The floods have caused huge displacements as 7.9 million people are affected, and thousands of them are taking shelter in temporary camps. The floods have heavy impact on the economy, health system and overall, wellbeing of people (OCHA, 2022). The human and infrastructure impact are devastating in Baluchistan and Sindh province. A huge challenge is to access the submerged areas because 12716 kilometers of roads have been wiped out and 374 bridges collapsed (OCHA, 2022). The unexpected disaster has caused a lot of damage causing widespread human, material, socio-economic and environmental losses which has exceeded the ability of Government of Pakistan alone to cope with the impact using our own resources. Additionally, it has raised debate about climate change and its possible impact in future. In this context, it is important to discuss the questions of how to improve the efficiency and effectiveness of humanitarian relief work in future as disasters have consequential impact in form of severe disruption in supply chain which also impact the relief work and over all humanitarian logistics and supply management.

Supply Chain Management (SCM) refers to the effective and efficient management of information flow, product flow and funds flow with respect to supply chain activities in order to serve a customer order or request. The supply chain activities cover planning, sourcing, production, distribution, logistics, information system needed to coordinate these activities.

A humanitarian logistics services specialist firm, Fritz Institute define relief logistics as:

“the process of planning, implementing, and controlling an efficient, cost effective, flow and storage of goods, materials and related information from the

point of origin to the point of consumption for alleviating the suffering of effected people.”

It means that to support vulnerable and afflicted areas, Relief Supply Chain Management (RSCM) is a process or system that entails employing knowledge and skills to mobilize resources and people through the effective and efficient integration of numerous functions, including readiness, planning, warehousing, distribution, managing of inventory, transportation, tracking, and tracing, from the point of origin to the place of consumption. Efficiency means “doing the thing right” and effectiveness refers to “doing the right things” (Provan & Kenis, 2008). Effective management of relief supply chain requires prompt supply of goods and services in a limited amount of time (Cozzolino, 2012). Relief-SCM efficiency management focuses on minimizing the spoilage, pilferage, avoiding redundancy and duplication of activities, optimizing the overall operational cost (Provan & Kenis, 2008).

The primary purpose of this research is to identify challenges and issues of relief supply chain management typically with respect to Flood 2022 relief activities in Sindh, Pakistan. The goal of the study is to recognize challenges in the aid distribution supply chain and envision best practices from Business Supply Chains for use across the relief projects.

Relief SCM are at ad hoc with an emphasis of responsiveness while business SCM aims at effectiveness and efficiency and over all supply chain profitability. Therefore, the comparison will help to suggest better strategies and plans for bringing effectiveness and efficiency in relief Supply chain by refining logistics operation, minimizing wastage, avoiding spoilage, optimizing the reach and irregularities in distribution at site. These areas are well managed in business models, while during relief, responsiveness is mostly the priority.

Based on the above objective, the research explores What relevant aspects of business supply chain can be applied for operational efficiency of relief supply chain. What business logistics and distribution strategy can bring effectiveness to the relief supply chain. How an integrated centralized distribution model and coordinated efforts of all relief actors will help in properly carrying out relief response towards restoring normality. Identify notable gaps that can be addressed in future studies.

This study is significant for those who are beneficiaries of relief work as well as those organizations who are working for the relief work. The study is unique because there is a dearth of research in SCM and humanitarian relief work in the context of Pakistan especially from the aspect of adapting business model to a relief work model. It will help understand the issues of humanitarian relief work, new efficient ways and course of action can be identified and suggested to the relevant organizations to enhance efficiency and effectiveness of relief work.

## **Review of literature**

Over the past few decades, empirical evidence shows that frequency of disasters has increased exceptionally around the world. There have been several unanticipated and unforeseen incidents over the past few years, including corporate failure, natural disasters, terrorism, and labor disputes, that have seriously disrupted logistics and supply chain operations. These incidents have shown how many supply chains are vulnerable and the risk that many logistics operations and supply chains face that needs adaptability and new approaches.

Pakistan faced disasters of high magnitude in the past decade as well, the earthquake in 2005 which mainly hit the areas the then N.W.F.P and Pakistan administered Kashmir areas. This was one of the deadliest earthquakes in the recent history and resulted in a number of casualties, a large number on injured and millions left homeless (Naeem, et al 2005). The buildings were damaged, and it needed reconstruction as well as rehabilitation of people. Some international reports show that although the loss was high, but many countries, international organizations and NGOs provided supplies including food, medical, tents and other required items. A report by Phister et al (2009) about the relief work for 2005 earthquake, an important point highlighted is that most of the emergency response was from the Pakistan military forces. This case study analyzed the NATO model used for relief activities. The important aspects covered were the information, coordination, and collaboration. The report shows that although the communication networks were affected but it was resumed to a medium level. The accuracy of data information and its sharing was identified as key problem. Further that information sharing with other organizations like UN and other organizations needed improvement and the report concluded that over the period of recovery, and with the mutual coordination of NATO and other international organizations the initial conflicted situation was improved to coordination.

Similarly, the floods in Pakistan in 2010 affected all four provinces and total 15,847 villages were affected as per NDMA statistics. The aftermath was loss of life and economy. Due to floods thousands of people got displaced. A number of studies and reports are published by World Bank, Asian Development Bank, sociologist, economists, environmentalist, and management scientists about different aspects to deal with natural disasters like floods, drought etc. They can be categorized as reactive approach for example what efforts have been made after the disaster occurred like PIDE 2010-2011 report about damage in the agriculture sector. Along with the time, the approach moved to pre- and post-disaster approaches and was reported in NDMA reports of 2010 to 2012. Nevertheless, the response to emergency remains a crucial element as the magnitude and incidents are reshaping from disasters like floods or earthquakes to diseases such as COVID-19. Therefore, the research about adopting better approaches with the help of technology can help us designing future strategies. The overview shows an alarming situation, and they cause extensive human suffering which requires timely response and relief work. The relief work requires a general logistic process that requires assessing requirements, ordering, receiving, sorting storage and dispatch. Hence the humanitarian logistics has gained much attention within the supply chain.

Supply chain management is defined as:

“the set of functions concerned with the effective utilization of limited resources that may reside with one or more independent firms and the management of material, information, and financial flows within and between these firms so as to satisfy customer demands and create profits for all firms”.  
(Chopra, 2016)

The above definition is common with corporate logistics. However, as Thomas, (2003:2) signifies that both commercial and humanitarian logistics have similarities, but they have yet to adapt their best practices. Humanitarian Supply chain management is focused on relationships among the stakeholders that make logistics movement

possible and is recognized as crucial to properly carrying out any disaster response.

Researchers define it as variously, for this research we cite Bhimani & Song, (2016)

“Humanitarian logistics is considered to be the set of actions taken by organizations in an attempt to move information, goods, and services for the specific goal of aiding target beneficiaries”.

Both terms are used interchangeably because they have commonalities and same objectives.

Cost effectiveness is the major difference between commercial supply chain and humanitarian supply chain because the latter is concerned in alleviation of human suffering and cost is not the primary concern in most cases. However, in both commercial and humanitarian SCM, quick response is required in both. Some other important differences in relief work are identified by Balcik & Beamon (2008) as

- unpredictable demand in terms of timing, geographic location, type of commodity and quantity of commodity
- short lead time and suddenness of demand for large amounts of a wide variety of products and services
- high humanitarian stakes regarding timelines in the face of a sophisticated global media and the high anticipatory attention of the donors
- lack of initial resources in terms of supply, human resource, technology, capacity, and funding.

Based on earlier research studies, supply chain management can be categorized in themes information sharing, coordination, collaboration, visibility, trust and agility.

#### **Information sharing and visibility:**

(Altay & Pal, 2014) argue that although there are many other factors affecting coordination, a better response is resulted from dissemination of the pertinent and dependable information. Sharing of relevant and reliable information is the key activity within an organization to achieve competitive advantage and is central for effective and efficient operations of the supply chain (Dubey, et al., 2020). Visibility can be measured by three items first shared level of understanding and access to product related information, second the accessible information about demand and supply and third, the degree to which they have information about relief item' inventories and to which extent movement of relief items can be tracked in the disaster relief efforts supply chain (Maghsoudi & Pazirandeh, 2016). (Dubey, et al., 2020) cite (Akter, & Wamba, , 2019) and (Altay, & Pal, , 2014) arguing that the circumstances that are complex during which relief supply chain operates involve the meticulous management of information amongst relief and humanitarian actors

#### **Agility:**

(Sahay, Gupta, & Menon, 2016) argue that in relief work, agility is one of the most important abilities to respond as quickly as possible and to adjust strategies to fulfill the needs after a disaster. It is a challenging task in case of humanitarian crisis due to unpredictable demands and complex requirements to be provided on time. Regardless of uncertainties, in humanitarian supply chain it has to be recognized as an important factor (Cozzolino, 2012).

#### **Trust:**

Another important managerial concern is trust, which can improve the supply chain functions and increase level of coordination among the relief organizations. (Luo , Dubey, Gunasekaran , Akter , & Hazen, 2018). It is considered an important element in commercial SCM, while it is of grave concern in complex environment to understand the roles, responsibilities, relationships, capabilities, and information sharing for effective collaboration (Dubey, et al., 2019).

#### **Coordination and collaboration:**

Coordination requires collecting, processing and sharing quality information effectively (Altay & Pal, 2014). (Dubey, et al., 2020) cite (Balcik et al., 2010) stressing that co-ordination means more than information sharing. It includes decision making, conducting projects together with division of tasks and categories of tasks of who do what related to the relief work. (Kabra, Ramesh, & Arshinder, 2015) study explores the barriers in coordination in HSCM in India using secondary data and survey method. The study identified organizational structure, top management commitment and lack of policy for coordination as major barriers in providing effective and efficient coordination among the various stakeholders (Kabra, Ramesh, & Arshinder, 2015). Similarly, other studies focusing on inter-agency logistics coordination are well documented, for instance Tatham & Spens suggest using USAR model to improve humanitarian logistics operations. Their study suggests that to meet the common goals of humanitarian services different organizations cooperate and coordinate which increase effectiveness and efficiency in relief work (Tatham & Spens, 2016). After a disaster, supply chain operations are immediate and ‘temporary’, they can be managed both as agile and stable through a well-coordinated flow of information. In addition, decisions about immediate solutions, need assessment as per available resources helps to improve efficiency (Merminod, Nollet, & Pache, 2014).

John et al. (2019) study about Chennai floods and rescue and relief activities suggest coordination as a key factor in supply chain in pre and post disaster relief work. The study suggest that need identification should be based on actual needs of beneficiaries rather than pushing the existing solutions. Additionally, it suggests for a common pool of information and sharing that information with local actors.

#### **Duplication due to non-coordination:**

Day et al. 2012 quote Ian Heigh, a practitioner with extensive experience in humanitarian operations, shared that the resources for humanitarian relief often go wasted because of duplication of efforts. There is a need to focus this area of research because it will save significant number of resources designated for relief work (Day, MELNYK, PAUL , EDWARD , & WHYBARK, 2012).

#### **Commitment:**

It is important for all the management practices and (Dubey, et al., 2020) used three items to measure commitment in their research because strong commitment leads to increased efficiency and effectiveness.

#### **Centralized facility and distribution:**

Centralized supply chain models are common in commercial SCM. In this system a single space or common facility having all the key components of supply chain i.e., logistics, distribution, and procurement. The supply chain is managed from this central office and departmental managers oversee their respective areas. Due to centralization, important

decisions are made on time. It also increases collaboration and communication which facilitates the standardization of systems and over all process. Supply chain network design (SCND) is introduced by (Nasiri, & Jolai,, 2018) mentioning that it determines the numbers, location, and capacities of facilities in supply chain management. It also includes the location of the facility, warehouse, and distribution patterns. It is dependent on many factors such as capacity of the facilities, customers demand, and government regulation among others (Maina & Zhang, 2019). Currently relief supply chain actors in Pakistan are working in a decentralized umbrella. Every actor is working individually which mostly result in redundancy and duplication of relief, while some flood victims remain deprived.

As discussed above, the importance of coordination and partnerships is necessary within humanitarian supply chains, because the stake holders involved are government, both civil and military, international organizations, local NGOs and to some extent corporate organizations. Ideally, these all should work in mutual understanding; however, it is not always desirable among organizations (Fenton, 2003). There are two ways of coordination, vertical alignment, allowing local organizations to work directly with organizations that handle the transportation of goods; while in horizontal coordination other organizations working on the same level might be approached (Balcik et al., 2010). Similar challenges might occur in information sharing, where organizations hesitate to share full information due to attention of media, or competition among organizations increasing the challenges of relief work (Wakolbinger & Toyasaki, 2011). Another important aspect is financial source of the supply chains. The sources are different in commercial and humanitarian work. The former relies on revenues while the latter receive donations including thousands of contributors and point of origins (Bhattacharya, Hasija, & Van Wassenhove, 2014).

Learning from work of private sector logistics and adapting it in humanitarian relief work has gained attention of researchers in the past two decades. However, authors also highlight the fact that the context is different in both, and one should be cautious about it. The complexity may be due to diversity of factors, invisible factors, ambiguity about resources, trained personnel, accuracy of information etc. (Wassenhove, 2006). Despite the challenges and complexities, different research models are suggested for humanitarian aid efficiency based on previous research. (Blecken, 2010) study was based on applying commercial supply chain principles to relief supply chain to solve logistical issues within organizations from a top-down perspective. The shortcoming in this model is that individuals may influence the donations.

Another model is auction procurement model of (Ertem & Bururgan, 2011), suggesting that organization could choose a partner based on their “bids” to support the relief work. This model is more successful for larger organizations because it left out the small and grassroot organizations. In this research, following model is used to study how commercial principles can be applied to relief work.

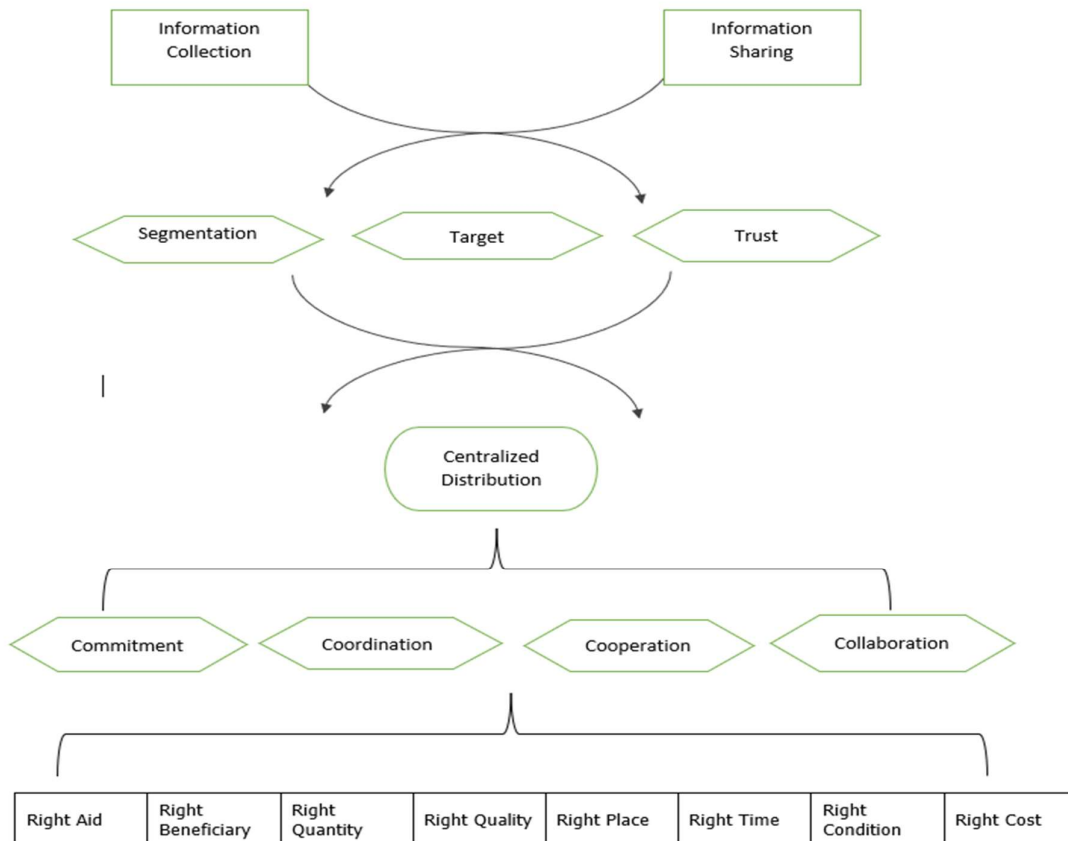
### **Conceptual framework development:**

Measuring the performance of an existing supply chain system or comparing it with others require selection of variables by which desirable results can be obtained. In the literature review, three Performance Measures including resource management, output measurement and

flexibility measurement was identified and nine Critical successful factors (CFS) in commercial supply chain management, were observed. These are, strategic planning, inventory management, transportation planning, participation, supply chain strategy, information management and technology utilization, coordination, capacity building and continuous improvement. Since all these factors influence each other, improvement in some can enhance the whole process. The focus of this research is mainly on collaboration and centralized distribution. A right supply chain strategy can help in managing financial and inventory sources successfully (Campbell & Jones, 2011).

Fig.1 shows the relationship among the different elements of supply chain management. Improvement in Information collection and information sharing would help in segmentation, where affected areas and people need (medical, food, shelter) can be split into different groups. The next step will be targeting the areas according to the required aid. Due to information sharing, visibility and trust develop between relief work organizations, which leads to commitment, better coordination and collaboration, which further affects agility. Different actors in this supply chain are working independently and they have their core competence and excellences which can be pooled in a centralized facility. The centralized facility will bring different organizations under one umbrella to enhance commitment, coordination, cooperation, and collaboration. This relationship will improve efficiency and effectiveness. Although, the unpredictable events associated with disasters makes the relief supply chain far more complex than formulating and designing a commercial supply chain, the key factors can still be adapted to apply and achieve the required results.

Fig 1: Conceptual framework for centralized relief work management





## **Methodology**

### **Research Method:**

This research required both primary and secondary data collection. Initially, secondary data resources were reviewed to understand the topic and models used by researchers to study the supply chain management in humanitarian relief work. Online data sources and data bases like JSTOR, Pro Quest, research gate, Scopus, Springer was used to study books and articles. The period of publications was chosen from 2010 and onwards.

### **Community data:**

Self- administered questionnaire is used for the collection of primary data and interviews guided by research questions, objectives, and existing knowledge (Ornstein, 2013). The questionnaire consists of open and close ended questions. It comprises of three sections demographic information, efficiency, and effectiveness measurement and lessons learnt in the SCM process.

The in-person interviews were conducted using purposive sampling method. The method was preferred because the most prominent organizations in the flood relief work are known through media and their work. They have been working in the affected area from the beginning and continue to work for the flood victims. The study population consisted of seven representatives of organizations including public, private, and few with international presence.

### **Ethical Considerations:**

Collection of reliable data depends on the source, and it is important to note that volunteer in-person meetings have some constraints and limitations such as time, lack of interest, trust issues, confidentiality. To fulfill this requirement, a letter of introduction about the title, objectives, and use of provided information for academic purpose was distributed along with the questionnaire. After the consent from these organizations, interviews were conducted with the help of contact persons. To ensure originality, the study was conducted cautiously avoiding plagiarism.

### **Data Presentation and analysis:**

The study is based mainly on qualitative data and there is a range of processes and procedures of data collection and interpretation (Rossman & Rallis, 2011). For this research thematic analysis is used to focus themes within data. The data from interviews are generated in tables and graphs where necessary.

### **Limitations:**

One of the main limitations of this study is accessibility of the target organizations. Due to their role in humanitarian work they had less time. In this study, seven major organizations perspective was taken due to time constraint, however, this kind of research requires perspective of beneficiaries' response as well. This aspect may serve a future direction for further research.

### **Result and Data Analysis**

This section is based on findings, presentation and interpretation of the data obtained during the study. The primary data was collected by questionnaires to analyze the current situation of relief supply chain in Sindh region and the challenges faced by them during relief work. The interviews were sought from seven major actors who are working or have worked for relief in flood hit areas. Their names have been retitled to respect the privacy of the

organization and interviewee. The data is presented in the form of graphs and charts followed by the interpretation of their results.

The recent flooding that occurred in Pakistan due to severe climatic conditions caused many irreversible calamities for the people of the country; it destroyed homes, their belongings were carried away with water never to be found again, the livestock was either carried away by the strong currents or the animals drowned. It has also destroyed farmlands, creating salt pans in areas where there was once alluvial soil in abundance. The floods have affected the economy, as due to these losses the government must fulfill their rights towards the people, so they have provided them with shelter, food, and proper clothes. Along with this they also gave them money to support them financially and get them back on their feet. In addition to this the infrastructure in numerous areas has been destroyed: roads have been cut off by the force of the water, power lines torn or disconnected. The loss in the form of infrastructure has created hurdles in relief work as well as pushed the economic conditions to an extent where it's difficult to work alone.

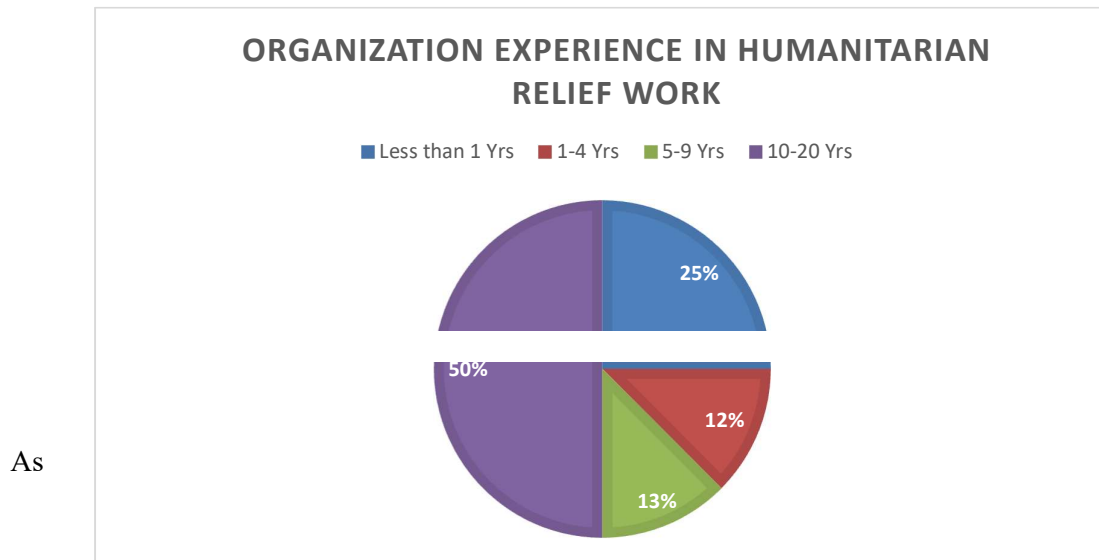
The data has been collected using a structured questionnaire including closed and open-ended questions. Total seven (7) organizations were contacted including public, private and an internationally known. Among others, some very famous and well-known organizations who have been working for relief work during floods. The information was collected from websites as well as contact persons and references for connecting these organizations. Few more were excused to share information mostly due to time constraint because they were expecting more time spanning on weeks to sought consent from their management before sharing the information.

Data collected during the study helped in categorizing the organizations working in relief work. First category organizations are public organizations in which organizational structure and operations are carried out for a long time, have permanent employed staff and vast scope and outreach not only due to skilled and experienced staff but logistical resources and data infrastructure. Second category is of those organizations which are engaged in welfare-oriented work with more than seven years of experience and have regular staff and limited scope such as major cities. Third category are organizations that have become united for a humanitarian cause, working on only volunteer bases, have skilled human resource engaging national as well as international donors through social media. These organizations have no hierarchal structures and are mostly, group of friends, communities, and professionals from different areas and of expertise. The data is analyzed in three sections, section A explains the demographic information, section B about the measurement of efficiency and effectiveness and Section C about way forward and lessons learnt.

### **Section A: Demographic Information**

Initial part of the data analysis comprises of demographic information of these organizations. Figure 2 shows the number of years these organizations have been engaged in relief work.

**Figure 2: Organization Experience in humanitarian relief work**



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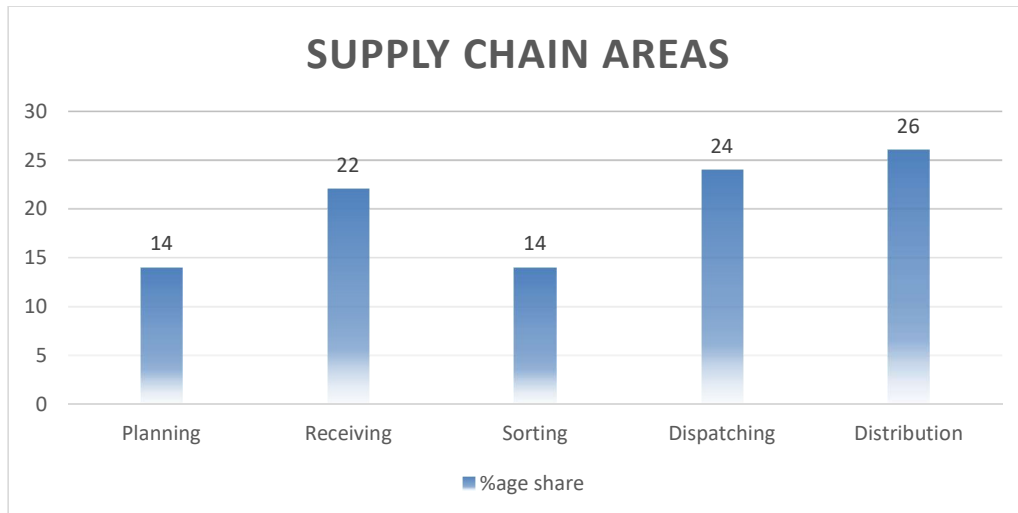
discussed above, the operational work of these organization varied due to their structure and formation. This can be observed in their response to four areas of relief work they were engaged in the fig 3.

**Figure 1: Disaster elements that organizations have been engaged**



The above data shows that most of the organizations spend time in mitigation. They were not prepared for such a catastrophe, and it took some time to respond according to the needs of people of that area.

This was supplemented with our other question of percentage of activities they undertook with regards to the supply chain areas during the recent flood relief. As described in below figure 4:



**Figure 4: Supply chain areas (activities) in which they worked during the recent flood relief (this is a mean of responses)**

As these two figures indicate that much of the efforts were made in two areas i.e., dispatching and distribution of relief sources. We can see that these two areas were more focused as natural intentions of response to affected areas. While less emphasis on planning and sorting of these resources and targeting the specific segment from constituencies according to the needs of the displaced people which also resulted in duplication of work and distribution of resources to same constituencies at the same time by many organizations. One of the respondents shared during the interview,

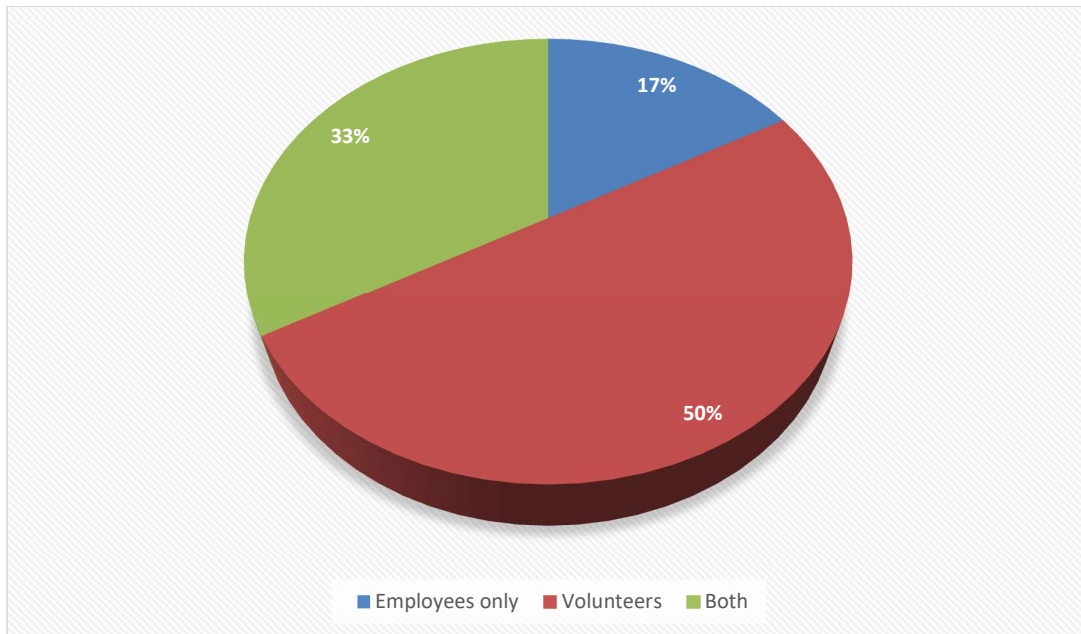
“in many areas duplication was observed in distribution of cooked food. We observed that at a given time more than few organizations were distributing food in a specific single constituency or area in constituency that resulted in wastage of the resource as it could not be stored until next mealtime, while it would have been dispatched and distributed to an area which might have probably been missed at that given time” Respondent Interview Org. 3

“One of the interviewees pointed out that although Org-6 has received and collected plenty of the resources in terms of foods, shelter etc but much were damaged and wasted due to frequent raining spells and their limited logistics and distribution capacities.”

The NDMA Monsoon strep 2022 of September 25<sup>th</sup> tell us that 23 districts in Sindh were calamity hit notified with affected population of 14,563,770. The focus of this research was mainly organizations working in Sindh. Most of them identified Dadu, Larkana, Mirpurkhas, Badeen, Thatha and Meher among many others as the most affected areas. During interviews one of the respondents mentioned:

“some of the areas were not accessible because our vehicles could not go into the submerged areas, we didn’t have the proper vehicles or equipment” Respondent Interview Org. 5

Another indicator by which these organizations were categorized was number of employees and volunteers. Fig 5 shows that organizations with large scope and outreach had both employees/staff and volunteers.



**Figure 5: volunteers/employees/staff were/are engaged in flood relief work**

During interviews, respondents mentioned that these organizations were satisfied that they were able to respond for the relief work, although in beginning they were not prepared, and it took some time to understand the needs of the people of affected areas, but later things started to work with information pouring in through different dissemination channels i.e., public, media, social platforms etc.

The flow of information is an important element of relief work. Table 1 shows that 40% information about the need of items was collected and shared through social media. One organization mentioned that they worked for people living in ‘temporary tent cities’ and they shared information about their relatives and friends who needed help.

**Table 1: Sources to identify and collect information about the target recipient:**

Source of Information	Response
Media (electronic/print)	25%
Social Media	40 %
Volunteers working in the field	20 %
Other (flood victims in camps)	15 %

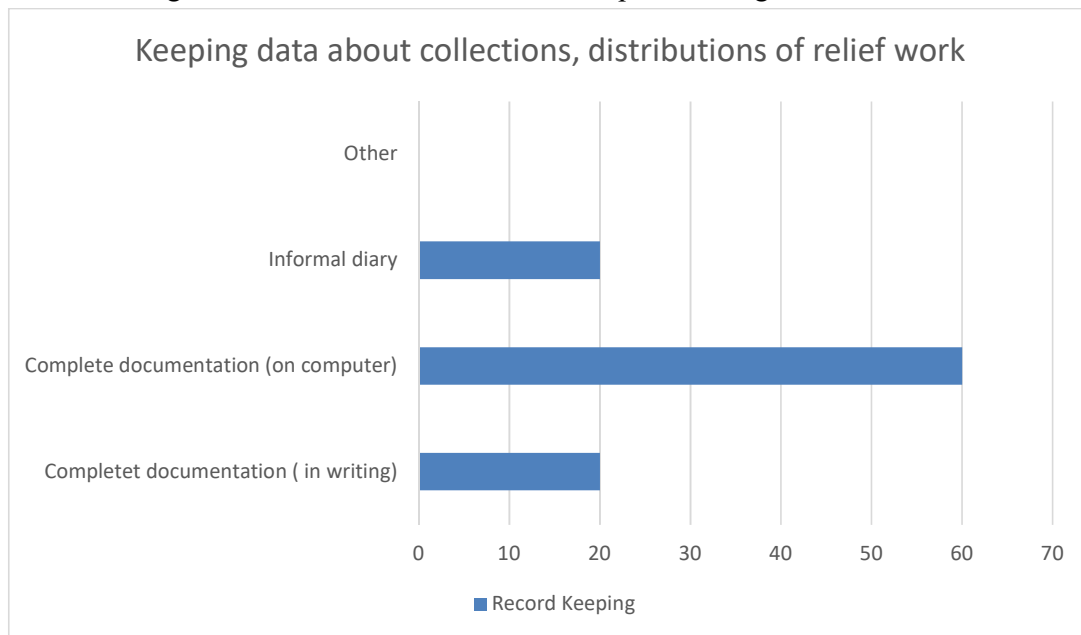
**Critical Success Factors (CFS):**

As discussed in conceptual framework, in this study two critical success factors are focused. First, coordination and collaboration among the relief work organizations. Almost all the organizations are using social media for sharing information ( see table 1), collection of information, coordination and call for donations. In response to the question about collaboration with other relief organizations, most of them had little or no collaboration but the collaborative efforts were not sustained and were for a short term or limited to single activity. For instance, an organization of media group collaborated with a Diplomatic Mission and other media channels. Another well-known

welfare organization worked on a project with one of the multinational companies. Public and welfare organizations mostly worked in their own capacities with a minimal holistic involvement of all the actors as a sustained collaborative effort for a common combined and shared goal.

There was also variation in collection of fund and commodities for the relief work. 60 percent had both cash and commodities while others were only focused on cash or commodities. The donation calls were on media and all forums, and it received a huge response. But in many cases the items given were not suitable or could not be used by the flood victims especially clothes,

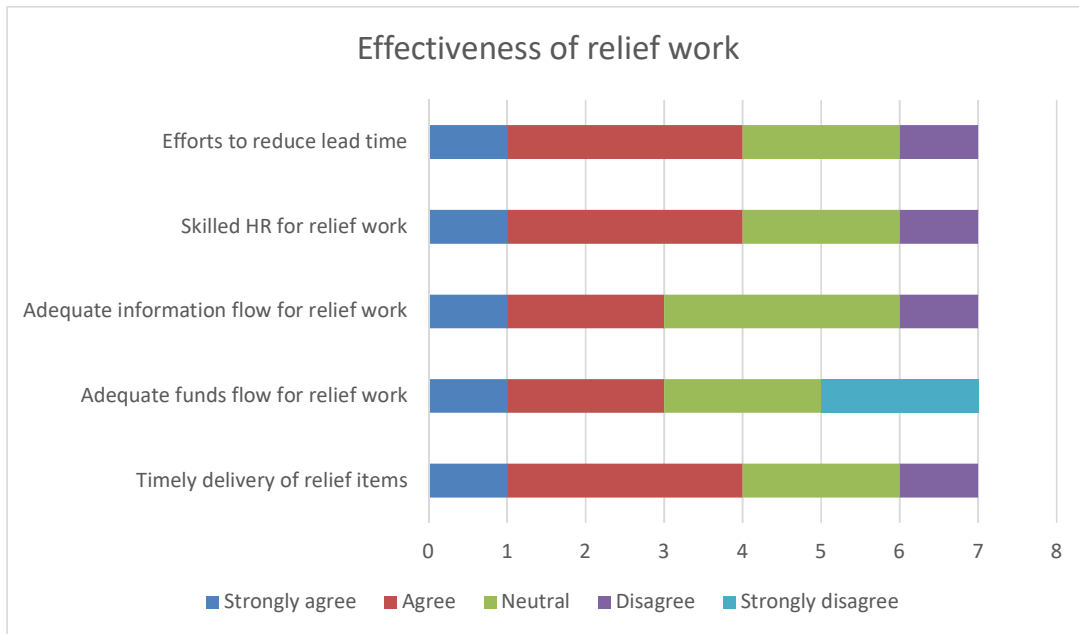
“People gave us clothes in donations, it had fancy clothes like the one wore in weddings in Pakistan, or some were not usable due to cultural differences, sorting that out became an extra work” Respondent Org. 4



**Figure 6: keeping data about collections, distributions of relief work**

Data from Fig 6 above suggests that category one organization had complete documentation and proper record for the relief work operations for Cash, Weight, Truck Loads, Constituencies targeted, while small volunteer-based organizations were keeping their record informal. It also varied because of the type of activities they carried out in the field. For example, average camp cost was reported as 10 to 12 thousand Rupees. They also had clarity about truck loads which was reported on average 25 to 45 thousand depending on the milage and deteriorating conditions. The study confirms the findings of similar study focusing on challenges faced in humanitarian work in India. (Yadav & Barve, 2016) used total interpretative structural modelling (TISM) approach to study the fifteen challenges in relief work. The research revealed that for sustainable relief work, strategic planning is required because it’s not a one-time activity, it takes a long time and people may face other disasters in future. Secondly, lack of in-country warehouses was also identified as a challenge for sustainable relief work.

**Section B: Effectiveness Measurements of the distribution of relief work**



**Figure 7: Effectiveness measurement of the distribution of relief work.**

D’ Haene *et al.* (2015) highlights that performance measure is gaining attention by researchers because it helps in improving the relief actions from preparedness to rehabilitation stage. In this study, resource management, output measurement and flexibility measurement were focused. In this context, above data (as shown in fig 7), it is interesting to note that nearly 50 percent organizations were satisfied with the timely delivery of relief items. However, they were concerned about the flow of relief funds which was high in the beginning and gradually decreasing with the passage of time. Similar results were observed for the flow of information, where it was observed a shortfall in the flow of information and news reports. As stated earlier, large scope organizations had staff and volunteers, but overall organizations were satisfied with their human resource, and they considered them skilled enough to work in these areas. In contrast to the question above, a validating question was asked about the delay in distribution of relief material, and five of seven organizations agreed that delays were caused because of the following reasons:



**Figure 8: Reasons for delay in distribution of materials (Source: Authors)**

A comprehensive data keeping could have been made possible with centralized communication and dissemination which ultimately provides visibility and that leads to agility in operations. This also helps to make an easier analysis and enlighten future planning decisions as a reference.

Most of the organizations which are contacted for the research are based in Karachi. They have a main office and other units in different districts of Karachi except for two small volunteer-based organizations. The donations received in form of commodities was collected at a designated facility of their own, some sorted and re-packed, few minimally labeled for dispatch. All the steps in process of operation were not carried out in most cases. However, all the organizations agreed with idea of centralized collection and distribution facility. One of the respondents urged on centralized efforts stating:

“People didn’t know what to send and how to send, the strategy should be collection information for the required items, one organization should take the lead, which is obviously government, and others can send their representative to the facility where all the collection and distribution will be done, in this way there will be transparency in the process and every organization will share their part.” Respondent Interview Org. 5

Another respondent claimed that:

“if it would have been work in collaboration and coordination the collections were enough for coming 4 to 5 years” Respondent Interview Org. 4

Respondents stressed on the importance of combined efforts and centralized facility but there are some challenges as well such as competition among the



organizations, everyone wanted their organization to be prominent. Schmitt *et al.* (2015) cite Eppen who use multiple-location model and shows that when there is uncertainty in demand, a centralized facility is beneficial, and it reduces cost. In case of a disaster relief work, the demand is uncertain, and pooling of information and resources helps meeting the different levels of services required.

### **Discussion:**

The improvement in capabilities of humanitarian supply work and application/adaptation of private sector logistics has been an area of research that has gained attention in the past two decades. There are many examples where humanitarian organizations have adopted private sector efficiency-based approaches for sustainable relief work. (Wassenhove, 2006) explores the idea with some case studies how joint efforts learned from each other's partnerships. Additionally, he stresses on operational research academics role together with humanitarian organizations and private business for effective supply chains. Therefore, this study fills a research gap in the context of Pakistan and adds valuable field experiences of the stakeholders working in relief operations. A recent study by Paccrotti *et al.* (2021) focus on standardization of logistics operations to improve the efficiency. The study discusses that due to difference in operation procedures in humanitarian supply chain relief actors the measurement of performance becomes difficult. Furthermore, it will also increase coordination among the stakeholders to increase efficiency at global as well as local level.

The results and data analysis bring us to the basic argument of this research that adopting a CPFR model can increase the efficiency and effectiveness of the relief work of the flood affected areas in Pakistan. It is pertinent to adapt CPFR model, the Collaborative Planning, Forecasting and Replenishment (CPFR) is the supply chain approach, that emphasis on strong integration in supply chain, combined effort, and practices. It urges business firms to partner in planning key activities to achieve effectiveness in fulfilling customer demand with cost efficiency. This combined effort and collaboration includes but not limited to strategic planning, forecast of sales, inventory management, replenishment activities, distribution and logistics, information, and fund flow, and even extends to customer feedback and adapting accordingly. CPFR guides people about common practices, processes, and establish metrics to help partners in supply chain to achieve the collective goal of supply chain surplus or profitability. Strong collaboration, effective communication and timely sharing of relevant information gives a meaningful insight which is crucial for the successful implementation of this strategy. A study by Awan & Shafiq (2020) finds correlation between variables like uncertainty, communication, infrastructure, human resource, funds limitation and humanitarian supply chain. The study concludes that international organizations such as Oxfam, Care International, ICRC UN agencies and many others are successful because they have standardized operational policies, when these organizations work in collaboration with local organizations that will transfer knowledge and experience as well as build the capacities of local NGOs and civil society to operate in SCM efficiently.

CPFR aims to reduce silos, by urging for collaboration among all parties and focusing on common goal so that details and opportunities are not missed. Walmart, the world biggest grocery retail chain has used this model successfully and still uses CPFR through "Retail Link" with its suppliers by giving them access to forecast numbers and feedback for recommended

adjustments. In case of relief efforts, the humanitarian actors can follow this model by syncing their activities and core competences. As discussed earlier in Fig. 1, improvement in information collection and information sharing would help in segmentation, where affected areas and people need (medical, food, shelter) can be split into different groups. The next step will be targeting the areas according to the required aid. Due to information sharing, visibility and trust develop between relief work organizations, which leads to commitment, better coordination, and collaboration, which further affects agility. As results of the study shows during interviews three organizations mentioned that they worked without collaborating with others which limited their access of areas. Different actors in this supply chain are working independently and they have their core competence and excellences which can be pooled in a centralized facility.

Some strategies and actionable steps from the CPFR key features might involve the following processes:

**Developing a consensus and agreement among the humanitarian actors to partner in relief efforts:**

It is essential to have a detailed consensus among the partner organizations and information of their competitive advantage that can help towards bringing excellence to the relief supply chain. As some may bring excellence to resourcing & planning, others excel in coordinating and inventory management, storage, few have expert skills in distribution facility as a fulfillment center, logistics and equipment that help broaden the outreach to affected area, by pooling all these distinctions, fulfillment is more effective rather than organizations working in silos.

**Creating a combined plan:**

A combined plan needs to be developed, which ensures every partner work on a collective goal sharing their expertise for common objective of relief. This plan must delineate precise information about tasks management of the partners and among the partners along with data management. This may also include estimating current capabilities and the required capacity to achieve the objective. The lead should be taken by the government and other organizations can work contributing their capacities and capabilities.

**Estimate the damage, forecast from available information**

Using knowledge from volunteer teams, media, and other resources; a forecast is made for required resources in terms of food, shelter, health in relevant constituencies. Assessment of need is a crucial step for planning the activities and fulfilment action in uncertain, rapid changes in demand and diversity rather than an ad hoc type project relief supply chain. Although this seems to be an important aspect in beginning, but it's a process, like in a commercial supply chain the demand is continuously updated, similarly in case of humanitarian relief work, the needs will keep on changing in pre and post disaster and rehabilitation times.

**Identification of Deviations and Exceptions in damages forecast:**

Now is the time to compare and corroborate the forecast made initially and incorporate changes that new information may urge to find and adapt to challenges of deviation.

**Estimate the number of resources that can be made available to achieve relief goal:**

Based on the damage forecast and organization pool of competencies, the estimates for inventories level in terms of cash, food, shelter, distribution, logistics etc that can be sourced and pooled by partners and pooled to a combined fulfillment center and local distribution

center's network.

### **Identification of Deviations and Exceptions in resources forecast:**

This is much like we practice in finding and resolving the damage forecast deviations and exceptions. It is obvious that resources may not be collected to the number they were predicted. This step also helps to revisit the issues, revisit the strategies and incorporate changes as well as adapt to situations.

### **Resolving deviation and exception:**

The key is to communicate the deviations immediately enabling the impacted partners to adjust to exceptions.

### **Aligning incentives:**

Sharing risks and benefits are critical to success, synchronized objectives augment the collaboration performance of Relief Supply Chain Management over long term. Incentives must be positioned as so that to avoid any opportunistic acts. Partner's focus should be aligned with collaborating for welfare rather than individual amelioration.

### **Conclusions and Recommendations:**

Adapting to CPFRR in relief efforts with reference to Pakistan, may look like a difficult task at first glance. The biggest hurdle that might come across at the start, can be getting out of silos and adapt to change. Although there can be numerous strategies for CPFRR, the procedure described above can be altered to adjust to changing demand in desperate circumstances. This process is iterative and can be affected by the working environment of partners organizations. The need to adapt a new normal and adapting to changes in internal processes can help to implement CPFRR. Opening line of communication between different relief actors, collaborating expertise to a common goal, can result in elevated responsibility and trust once the partners see payoff and are certain of shared trust over the team up areas.

Nevertheless, for the way forward, it is suggested that future strategy requires improvement for better results. The government has the most important role and has the capacity to engage with other partners and stake holders. It may take five to six years to rehabilitate these areas and people therefore a sustainable plan is required.

A reasonable approach for the government to tackle this issue involves many suggestions such as turning of Expo Center Karachi into a huge isolation center and then the idea of using it as centralized vaccine administration center not only helped the people to reach out to facilities but served as centralized data management hub for further planning and timely decision and proved to be a very good approach. This information and gradual preparedness efforts helped the Government in tackling with evolving waves of pandemic. Another strategy for both government and other actors in relief work to improve the efficiency of SCM during flood relief work could be to centralize the relief efforts. Therefore, Expo Center Karachi can be assigned as centralized facility working as fulfilment center where all the organizations pool their collections, expertise, and capacities & capabilities. Which will be providing a collaborative platform where the collected information will be shared for visibility of the situation to derive a meaningful insight. This can be made easier with a mobile application to which volunteers, staff and others can upload the observed data. This mobile application can bring the data into one place, with all the partners feeding real time information which will lead to needs identification, segmentation and target areas, dispatch data will result in distribution

excellence. A dashboard fed by such application data will portray data collection, requirement, and fulfilment. The cellular companies can also be engaged in this pool to which they can provide free service to operate this application to registered volunteers, staff of these relief actors. One such example is recently witnessed during Ukraine's war where Elon Musk Starlink network was offered for communication, energy restoration and war efforts when internet services were disrupted due to War. In case of emergencies, the ambassadors can be engaged, and help can be sought from such services. Similarly, Google can be contacted at ambassador level for lending images through satellite.

We have recently seen the disruption of supply chain caused by the pandemic of Covid-19 that affected the breadth of the world at such a large scale. Not only did it unveil the lack of preparedness, shortages of essentials, complication of distribution but emphasized and enlightened the collection of information and timely dissemination of the same to the masses for awareness, visibility of the situation, change to use of technology platform specially for learning, that would otherwise have not been adapted in a community like us. We have noticed that NDMA informed public through social media and frequent press releases and live briefing about the awareness of the situation, observation and data about cases dense areas and crowded health facilities. It used to collect information and publish and broadcast on mainstream media on daily bases. The data was about new cases, deaths, hikes, and trends and based on this real time data government decided lock downs or smart lock downs, social distancing, speedup of supplies and other necessary measures. Not only mainstream media was used but also IT and social media was also used for awareness. Using the same model of "an information dashboard" for emergency relief work due to floods can be also useful in collecting information, sharing and timely update to the pool of humanitarian actors that can be turned into meaningful actionable insight to streamline their activities according to the needs of the survivors and can target the devastated areas. It is pertinent to note that in September 2022 a dashboard for transparency of flood relief aid, Pakistan Government has launched a website "The National Flood Response Coordination Centre (NFRCC)" which provides the details of the aid provided to the people in flood hit areas (Tribune, 2022).

More research is needed on investigation of improvement in RSCM through CPFR model, and incorporating strategies of cooperation, coordination and collaboration among relief actors, that may open line of communication among partners to elevate shared trust, as these findings will result in humanitarian operations improvement, tracking and traceability and measure of relief efforts with as less as possible duplication and wastages due to individual limitations of capacities and flexibility to adapt to change. Our study may give opening ideas that can be followed in further research with a broader scope with respect to Pakistan and its dynamics.

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