Chapter 6
Relief Network Model for Efficient Disaster Management and Disaster Recovery

Sumeet Gupta, B.S. Sahay, and Parikshit Charan

6.1 Introduction

The world has witnessed a large number of natural disasters in the last decade. The earthquake in Indonesia, floods in Uttarkashi in India, cyclone in Tamil Nadu, hurricane in Maine, and tsunami in Japan to name a few have been on the news for quite a while in terms of the massive destruction brought about by them. Such disasters not only clog the government machinery and drain its resources but also mar the progressive efforts toward the development of a region. With the Bhuj earthquake in 2001, the Government of India took steps to develop a comprehensive disaster management program in India. In the year 2005, the Disaster Management Act[1] was passed defining various preventive measures for dealing with disasters as well as outlining steps for disaster recovery. The responsibility for disaster management was placed on the state government. A number of disaster management authorities were created in each state directly under the Ministry of Home Affairs. Disaster management faculties were also opened in the state-run training institutes. However, in spite of such effort, the Government of Uttarakhand was left wonderstruck with the cloudbursts of Uttarakhand in 2013 that caused massive destruction. It was least prepared to deal with such disaster although the ominous effect of their efforts of building a dam on River Kedarnath was well

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[1] http://www.unisdr.org/2005/mdgs-drr/national-reports/India-report.pdf

S. Gupta (✉) • B.S. Sahay
Department of Operations and Systems, Indian Institute of Management Raipur,
Raipur, Chhattisgarh, India
e-mail: sumeetgupta@iimraipur.ac.in; bssahay@iimraipur.ac.in

P. Charan
Department of Management Studies, IIT Delhi, New Delhi, India

Department of Operations and Systems, Indian Institute of Management Raipur,
Raipur, Chhattisgarh, India

predicted by locals as well as environmentalists. The supplies were disrupted, and a number of voluntary organizations started their relief efforts, but for 3 days no relief reached the affected people.

The first visible effect of disaster management in India was observed only during the recent Phailin cyclone that struck the coasts of Odisha state at Gopalpur on 13 October 2013. Before the cyclone could show its strong face, around 900,000 people were evacuated and relocated. The cyclone did prove to be massively disastrous for the livestock and natural resources on the coast, although, only a few fatalities were reported as an aftermath of the disaster. The cyclone resulted in the River Phalgu of Jharkhand getting filled with water, which usually ran dry for years. It was considered a benefit in disguise due to floods. The water gates were opened, but this resulted in floods and destruction in five districts of Bengal, which claimed around 9 lives[2]. Thus, while the Government of Odisha and the state government were prepared for dealing with Phailin, they did not estimate that Phailin would result in floods in Bengal. The cyclone was supposed to pass through the states of Jharkhand, Andhra, and Chhattisgarh. However, situation in these states remained calm. In other words the estimated effect of the cyclone remained unpredicted, although their efforts to deal with it in the state of Odisha were commendable.

The above two cases hint at the need for development of a model whereby greater capacity building is needed for dealing with major disaster calling for not only awareness but also participation from private firms, NGOs, and other organizations. While help may be available in abundance, what is required is a well-coordinated and selfless effort from various organizations. Different organizations voice their concern differently, and such concerns can have a debilitating effect on disaster management and recovery efforts of the government and other relief agencies. Building buildings from ruins is the business for many. Different people view natural disasters differently and try to benefit from the disaster. Unless a well-coordinated effort is launched by the government to deal with such disasters, the attempt to benefit from such disasters in some way or another will continue. This gives rise to agency relationships whereby different ostensible beneficiaries of disasters attempt to thwart each other's efforts in the name of helping people. The result is complete chaos, choking of logistics and delaying recovery efforts. In order to achieve proper coordination, it is important to understand the outlook of different stakeholders in a disaster.

Scientists attempt to prophesize their theories such as viewing it as a result of subterrestrial movements or the movement of winds. The Japanese tsunami, for example, was attributed to the earthquake deep within the sea that propagated seawaters to inundate Japanese coasts and caused other significant damages. Similarly, the India Meteorological Department estimated and forewarned the approaching Phailin, and the disaster management efforts were conducted well before Phailin could significantly damage human lives. The forecasting was done

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[2] http://www.firstpost.com/india/phailin-effect-in-bengal-nine-people-lose-their-lives-in-floods-1178323.html

by the Joint Typhoon Warning Center and other US forecasters who estimated Phailin having a peak intensity at Category 5 level although the India Meteorological Department was less conservative in predicting its intensity.

Religious protagonists viewed it as a wrath of demigods, indicating that something is not right with the way people are approaching life. For example, Uttarakhand floods were attributed to playing with Dhari Devi temple by the Government of Uttarakhand. The wrath took away the lives of thousands of people leaving behind the historic temple of Amarnath. A number of people turn to God during such disasters. Environmentalists view such disasters as the wrath of nature on people. Again the floods in Uttarakhand were viewed as a result of disturbing the ecosystem by building dams and other projects in the otherwise calm atmosphere of Uttarakhand. The similar thing happened when the Government of India tried to break Rama Setu in Rameshwaram in India. The machinery was drowned in the sea. Scientific circles may argue against religionists view, but such views should not be overlooked. The general mass doesn't understand scientific terminologies and, therefore, during the disaster turn to some higher authority which is beyond the control of the federal government.

A number of organizations view such disasters ostensibly as a means of CSR activity. Google, for example, provided helpline and people location service through its people finder service during Uttarakhand floods and Phailin's endemic. We do not have the estimate of help provided by Google's service, but the recent note on its website indicates the data collected by this service could be subjected to misuse. Their people finder website[3] for Uttarakhand reports that Google has deleted the data entered in people finder's website, but such data may be available with active Person Finder sites and that Google does not review or verify the accuracy of data available with them.

Some other firms view it as a means of brand promotion. A number of organizations sprung up with large banners of their philanthropic activity only to grace their corporate magazines with such relief effort to garner public image. The *Times of India*, for example, noted on its website that it was the most read newspaper during the Uttarakhand disaster. It also noted the same during the Taj Hotel bombing by Pakistani militants in the year 2009. Many such firms gather money from the public to provide relief to the affected people. But it is never clear to the donors whether such money ever reaches the intended people. Even if it does, whether the form in which it reaches is correct or not is difficult to ascertain, and perhaps most people are least bothered to ascertain. They are happy thinking that they did their bit in providing relief to the people, knowing little that their bit might not have reached the intended recipient.

There are still others that use such disasters as a dumping ground for useless or unacceptable products. Consider the case of South African Development Community (SDCA), which experienced worst food crisis in over a decade during 2002. The United Nations under its World Food Programme (WFP) in collaboration with

the US Department of Agriculture (USDA) provided 0.9 million tons of genetically modified whole maize. However, Zambia and Zimbabwe both banned imports of such unmilled maize in entering the country as such maize could adversely affect the already poor agricultural economy of these nations. While the UN and WFP may have had good reasons for providing such relief effort, the fact is that genetically modified product has not been received so well not only in the world but in the USA itself. Monsanto has been lobbying the federal government of the USA to provide shelter to its seed in the name of improved variety and quality of seeds. Monsanto claims that genetically modified seeds are superior in quality and pest resistant. However, genetically modified seeds have received severe criticism all over the world. In the USA a number of eatables contain genetically modified ingredients. However, Russia and the European Union have categorically banned genetically modified vegetables and eatables. In India, Monsanto attempted to enter with its subsidiary Mahyco and tried to bring in biotech brinjal and biotech cotton. However, the Government of India has established moratorium over these products considering that as of now genetically modified products are not a necessity. Many view that Monsanto wishes to become the sole supplier and thus create monopoly for the genetically modified seed market. Genetically modified food lack taste and its pest resistant capabilities will make people eat chemicals and thus giving rise to another vicious cycle.

A number of organizations send unsolicited items during such disasters. For example, during the 2004 tsunami, which struck South Asia, Sri Lanka's Colombo airport reported that within 2 weeks of the tsunami, 288 freighter flights had arrived without airway bills to drop off humanitarian cargo (Thomas and Fritz 2006). A large number of ostensibly humanitarian supplies were inappropriate items such as used Western clothes, baked beans, and carbonated beverages which piled up at the airport, clogged warehouses, and remained unclaimed for months. Worse yet, these flights used the fuel available at the airport for returning, leaving the airport out of fuel for the scheduled flights.

During disasters many people try to turn their fortunes. For example, in the recent Uttarakhand disaster, there were cases where affected people were looted for whatever they had in their possession. Cases of organizations dumping nonstandard drugs in the name of relief efforts have also been heard of (Thomas and Fritz 2006). Moreover, the substandard practices of storage of relief items in godowns can eventually lead to dissemination of substandard food products to the recipients in natural disasters.

Not only natural but man-made disasters also complicate the situation. Consider the massive exodus of Assamese from their homes because of hate messages in Facebook and Twitter. Facebook and Twitter are available to everyone but if used improperly can potentially negatively influence a number of people and their lives. Even scientific advices may influence relief efforts. Many people (and even in scientific circles) tend to speculate about the reasons behind disasters, which may influence relief efforts. Not only that, improper estimate of an impending disaster may influence relief efforts. Governments may end up overspending or underspending. For example, the possible effect of impending Phailin cyclone in

the coast of Odisha, India, was overestimated by US disaster agencies although the India Meteorological Department stuck to its less conservative estimates and did not feel that Phailin would remain violent for days. And Phailin actually subsided in a day or two, although it damaged the coast of Odisha extensively.

Thus, different people have different agency relationships and outlook toward disaster, which may delay the recovery efforts. Most researchers (e.g., Kovacs and Spens 2007; Balcik et al. 2010) argue that effective coordination is essential for effective disaster management. To achieve effective coordination humanitarian researchers have proposed several approaches, the prominent ones being the cluster approach, chain coordinator approach, development of open networks, engagement of local population, and civil contingencies approach. However, effective coordination in a humanitarian relief chain has remained only a rare commodity.

ICT has been recorded to enhance the coordination efforts, such as that used during recent disasters in Thailand and India (Uttarakhand). This paper looks into the need of a disaster management organization and presents IT-enabled relief network model for efficient disaster management and recovery. Efficient disaster management requires assessment and capacity building before a disaster strikes so that the disaster recovery work goes on smoothly; otherwise, the entire logistics channel gets clogged. The development of relief network is based on the discussion by Thomas and Fritz (2006) on establishing partnerships and draws from the strength of various coordination approaches proposed by researches and combs them with the effective implementation of ICT for improved coordination.

6.2 Literature Review

6.2.1 Humanitarian Relief Supply Chain

To understand this model we first understand a humanitarian supply chain as well as the needs of a relief agency during the disaster. A typical humanitarian supply chain is shown in Fig. 6.1.

In a humanitarian supply chain, there are financial flow and physical flow of goods from owners/government and partners to the relief agency which supplies them to the affected people. When suppliers ask money for the goods supplied by them to the relief agency, there is financial flow from relief agency to the suppliers also. The information flow moves backward.

The second thing we need to understand is the needs of a relief agency. Different disasters have different impact as well as different requirements. Only a proper impact measurement can help estimate the requirement of a disaster. However, a few aspects are usually common to any disaster be it floods, droughts, famine, earthquake, tsunami, cyclone, plague, or massive killings/bombings. The immediate effect of a disaster is usually dislocation of people and disruption of supplies. People are left without shelter, food, or water, cash strapped, and needed medicines.
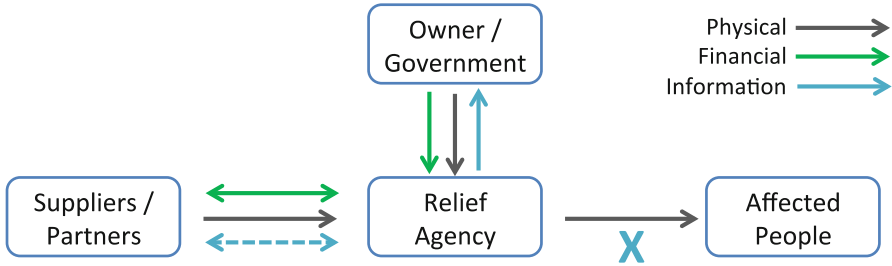
Fig. 6.1 A typical humanitarian supply chain

Moreover, there are chances of emergence of an endemic or an epidemic in the disaster-affected area. So, in other words, what is needed during a disaster is the supply of first aid and basic amenities like clothes, shelter, and food. Moreover, volunteers are required for recovery effort as the relief organizations may fall short of manpower for their relief effort. And the more manpower trained, the better as there are chances of the volunteers of relief efforts themselves falling sick or catching disease. The Indian Army carries out most of the relief operations in India as it has the most trained personnel to carry out such relief efforts. Although the basic requirements are few, but they may take various forms, most of which may not be useful for the recipients. The already discussed example of providing carbonated beverages to the 2004 tsumani-affected people is a case in point. Therefore, a coordinated effort is mandatory for both disaster management and disaster recovery. And the most important thing that is required is the establishment of a communication link between the affected people and their relatives/friends. The panic caused during disasters makes it difficult to establish contact between people and the resource-stripped relief agency. Therefore, a proper IT setup would help establish such a communication link between various parties involved in a disaster.

6.2.2   Need for a Coordinated Effort

The international supply network of humanitarian assistance for managing disaster comprises donors, aid agencies, nongovernmental organizations (NGOs), logistics providers, and governments (Kovacs and Spens 2007). Several researchers have argued for proper coordination among these participants in the supply network of humanitarian assistance for an effective and efficient management of a disaster situation. Nilsson et al. (2010), for example, argue that the prospect of handling disaster and crisis-like events depends on flexible and well-functioning response system at various hierarchical levels. According to Granot (1999), disasters are increasingly viewed as a shared responsibility (Trim 2004), and inter-organizational cooperation is required in order to meet unusual needs. Akhtar et al. (2012) argue that coordination among organizations is a necessity in such

circumstances because it is almost impossible for a single organization to fulfill the needs of people affected or rebuild the infrastructure. Hence, different organizations come together to react to these disasters and provide food, water, tarps, shelters, medicines, and other supplies to the affected people. They also assist in the reconstruction of the damaged infrastructure. Balcik et al. (2010) define the term coordination as "the relationships and interactions among different actors operating within the relief environment." In commercial chains, Spekman et al. (1998) and Cao et al. (2008) believe that the coordination system brings together the sequential-interdependent activities of organizations such as suppliers and retailers. These organizations coordinate tangible and intangible assets such as organizational processes, people, management skills, and experiences. They align existing resources with these coordinated assets as well as equally share benefits and risks to manage globally scattered chains. In humanitarian relief chains, this mechanism occurs among different organizations such as among international relief actors, among international relief actors and local organizations, and among relief (both local and international) actors and private or government organizations (Balcik et al. 2010).

Collaboration becomes difficult especially when one is working across political boundaries and/or coordination across organizational boundaries (Connelly 2007). Many factors contribute to coordination difficulties in disaster relief, such as the inherently chaotic post-disaster relief environment, the large number and variety of actors involved in disaster relief, and the lack of sufficient resources (Balcik et al 2010). Lack of coordination among chain members has been shown to increase inventory costs, lengthen delivery times, and compromise customer service (Simatupang et al. 2002). Since logistics accounts for 80 % of relief operations (Van Wassenhove 2006), relief chain coordination is key to improving relief chain performance.

Kovacs and Spens (2007) argue that the preparedness phase is the one in which the physical network, IT systems, and the bases for collaboration are developed so as to shorten the total response time for a disaster. During the preparedness phase, connection to feasible donors, suppliers, other NGOs, and other partners are created but not activated until a catastrophic event takes place. The network so formed comes handy during the immediate response phase where agile response is essential and when coordination and collaboration among all the actors involved in humanitarian response deserve great attention (Balcik and Beamon 2008; Kovacs and Spens 2009; 2007; Maon et al. 2009; Tomasini and Van Wassenhove 2009).

The need for proper coordination is also deeply felt because a disaster situation requires prompt and effective response as time saved means lives saved (Cozzolino et al. 2012). In several academic works, the agile principle has been linked to emergency and humanitarian operations according to the urgent effectiveness objective of the disaster relief logistics (e.g., Charles et al. 2010; Scholten et al. 2010; Kovacs and Spens 2009; Pettit and Beresford 2009; Taylor and Pettit 2009; Oloruntoba and Gray 2006; Towill and Christopher 2002). The agile response requires communication about the situation to partners, creation of a net with suppliers, construction of a dependable logistics system through the creation of

a stable net with 3PLs, and formation of a team to implement the emergency plan (Christopher 2005). As can be inferred, coordination among participants is the backbone for agile response.

However, researchers argue that humanitarians face greater challenges in collaboration as compared to their business counterparts (Kovacs and Spens 2007). Coordination of many different aid agencies, suppliers, and local and regional actors, all with their own operating methods, can be very challenging. For humanitarians, this is particularly true, because there is no profit motive, there is no clear command and control, and the priorities are also rapidly changing. Descriptions of relief operations frequently criticize aid agencies for lack of collaboration and duplication of effort (Kovacs and Spens 2007).

6.2.3   Coordination Models and Frameworks

A number of studies have proposed approaches for coordination for disaster response and humanitarian aid. While some of these approaches are generic, a few others have been borrowed from the existing practices either in civil society or military or from supply chains. A few authors (e.g., Burkle and Hayden 2001; Dynes 1994; Kelly 1996) have argued against transferring research knowledge from the military field to civil defense system although military assistance has been taken for dealing with disasters. Among the civilian response organizations, NGOs and international relief and development organizations operating on a global level are primarily examined to develop a contingency approach to dealing with disasters (Foreman 2008; McEntire and Fuller 2002; Shaluf et al. 2003; Trim 2004). They are also supplemented with the approaches developed by national disaster agents and communities or public utilities in relation to national and regional or local strategic and operational disaster planning (Kouzmin et al. 1995; Trim 2004; Quarantelli 1985).

6.2.3.1   Coordination Through Clusters

Cluster thinking has been suggested as a solution to the lack of coordinated disaster response. Clusters for diverse functions, including sheltering, logistics, and water and sanitation, can be viewed as an effort to achieve functional coordination. Jahre and Jenses (2010) discuss the potential of cluster concepts using supply chain coordination and intercluster coordination. Cluster concept is a means of coordination to be carried out in a number of areas. The cluster concept is defined functionally in terms of areas of activity, such as water and sanitation, health, shelter, and nutrition – which typically reflects the important and somewhat separate areas of relief work, often referred to as sectors (Inter-agency Standing Committee 2006). The idea behind cluster approach is to combine various operative bodies that specialize in areas like camp management, medical care, or water and sanitation

(Jahre and Spens 2007) but are largely independent and have their own funding and systems. When these organizations combine, they can face a series of problems related to coordination (Jahre and Jenses 2010). The cluster concept involves organizing humanitarian relief according to a number of sectors with a predefined leadership. According to OCHA (2007), clusters were introduced to improve efficiency in developing sufficient global capacity to meet current and future emergencies; predictable leadership at a global and local level; strengthened partnerships between UN bodies, NGOs, and local authorities; accountability, both for the response and vis-a-vis beneficiaries; and strategic field-level coordination and prioritization. Currently there are 11 clusters, namely, agriculture, camp coordination and management, early recovery, education, emergency shelter, emergency telecommunications, health, logistics, nutrition, protection, and water/sanitation and hygiene.

The benefit of cluster approach is the combined strength and the amenability to mobilization. However, once mobilized the clusters must cooperate with each other; otherwise, the lack of intercluster coordination itself will reduce the effectiveness of disaster management. Many NGOs feel that clusters are overly compartmentalized and there is no need for so many (ActionAid 2007, p. 5). Stoddard et al. (2007) asserted that the inadequate information management and analysis leads to weak intercluster coordination.

6.2.3.2 Chain Coordinators

The chain-coordination mechanism is defined as "a set of methods used to manage interdependencies among organizations" (Xu and Beamon 2006). Although there is no standard definition, Akhtar et al. (2012) define chain coordination as a process whereby the activities of interdependent organizations are brought together to achieve certain objectives. Chain coordination could be horizontal or vertical. Vertical coordination is where organizations coordinate with upstream and downstream activities, such as an NGO coordinating with transport companies to complete certain objectives. It is an arrangement between buyer and seller, entered into freely, to facilitate a mutually satisfying exchange over time, which leaves the operation and control of the two businesses substantially independent (Hughes 1994). Horizontal coordination takes place within a part of chain (Fearne 1998). In the horizontal coordination, different organizations coordinate with each other and manage interdependencies at the same level. A case of the horizontal coordination would be if one NGO coordinates with a second NGO (Balcik et al. 2010). Each chain must be coordinated by a chain coordinator. Such coordinators are the key players who are involved in major decision making, leading and controlling the main coordination activities (Mehta et al. 2003; Akhtar et al. 2010). The coordinators provide a leadership to the network of organizations and manage a portfolio of customers, customer priorities, and customer centricity and resolve conflicts and help manage and build infrastructure, information systems, training programs, and communication (Galbraith 2001). In humanitarian relief chains, the coordinators

are often central to the success of coordinating organizations because they lead a number of pivotal activities such as recruiting and retaining paid workers or volunteers, managing and developing staff, managing communication and information, allocating resources, managing accounts and funds, guiding senior managers, and building effective working relationships with relevant decision makers of involved parties like the government or other NGOs.

Research on chain coordinators (Akhtar et al. 2012) has revealed that chain coordinators often are not fully in control of chain-coordination processes. This is one of the main reasons most of collaborative efforts among NGOs have failed to achieve their expected objectives. In fact the good leadership of umbrella organization, coordination, and cluster approach is not enough to guarantee success. Organizations may face problems such as cultural conflicts, structural differences, increasing coordination costs, unnecessary coordination meetings, limited funding, language barriers, lack of cooperation from the host government, shortage of skilled workers, and suitable suppliers (Akhtar et al. 2012).

6.2.3.3 Open Network of Humanitarian Firms

Humanitarian supply chains share some common drivers with their business counterparts. It is critical to get the most out of scarce resources and limited budgets. It is also important to reach more beneficiaries in need and serve them more quickly. However, humanitarian supply chains have their share of unique drivers, such as increasing awareness, becoming better prepared for the next disaster, gaining more rapid access to accurate information about what is needed, and providing better security in the field. If two or more organizations can save more lives or ease more suffering by working together, they should seriously consider it (McLachlin and Larson 2011).

In choosing partners it is important to focus on their complementary capabilities and compatibility or "like-mindedness" (McLachlin et al. 2009). According to Lambert and Knemeyer (2004), compatibility of corporate cultures, compatibility of management philosophy and techniques, strong sense of mutuality, and symmetry between the parties are four fundamental facilitators or environmental factors that enhance partnership growth. Tatham and Kovács (2010) also discuss trust as a critical element in hastily formed humanitarian networks. Trust is more of the norm in disaster relief humanitarian supply chains. During rapid-onset disasters, "swift trust" among logisticians from a variety of organizations could spur improvement of relief operations. Hastily formed networks bring people from different communities together for planning and execution toward fulfillment of a large, urgent mission.

The governance of such loosely held collaborative relationships can be done in the form of hierarchies, markets, or networks (Seybolt 2009). Hierarchies are centralized, with formal rules and patterns for communication. While they can effectively coordinate units in a stable environment, they are slow to respond in environments of rapid change, as in humanitarian crises. Markets are adaptive to

environmental changes by enabling independent decision making by individual units. Seybolt (2009) suggests that the humanitarian system combines some negative aspects of both hierarchies (e.g., UN agencies) and markets (e.g., NGOs not cooperating with each other because they compete for funding). Seybolt (2009) further argue that a network approach could give the humanitarian system a useful combination of market and hierarchical governance. Networks are like markets in facilitating horizontal communication and independent decision making by individual organizations. They are also like hierarchies in attempting to reduce conflicts within the system and preserve individual organizations. Network members tend to work collaboratively to plan, implement, and evaluate their activities. This could lead to better coordination of humanitarian organizations (Seybolt 2009).

6.2.3.4   Engagement of Local Population

Humanitarian agencies generally suffer from a heavy turnover of field logistics staff (Van Wassenhove 2006), and this could be as high as 80 % annually (Thomas 2003; Thomas and Kopczak 2005). As a result, a number of agencies struggle to maintain sufficient suitably trained and experienced personnel to be able to respond effectively to natural disasters. An answer to this problem is to increase the involvement of the local populations. Using the case of Typhoon Ondoy (Ketsana) in the Philippines in 2009, Sheppard et al. (2013) explored how local populations can enhance their capacity to respond effectively to natural disasters, particularly at the municipal and village levels, with an emphasis on the final logistics stage – the last mile of delivery –when disaster relief is provided directly to the beneficiaries by local agencies. The main focus of humanitarian agencies during the post-disaster (response) phase in natural disasters is the planning and provision of the right kind of assistance, at the right time, and in the right quantities to meet uncertain demand. McLachlin and Larson (2011) argue that having local partners who have similar views could provide several advantages for coordination and collaboration for dealing with disasters. Such partners have deeper connections with local communities and local authorities. They also have a better understanding of the local culture and value system.

Tomasini and Van Wassenhove (2009) recommended that the greater involvement of the local private sector organizations in the preparedness phase and between disasters is a solution to the lack of indigenous capacity. In areas beset with a significant number and range of natural disasters, a semipermanent response supply network could be established, with private sector organizations being involved as partners in donating money, goods, and expertise to the local population both in improving levels of preparedness and during the actual response phase. The private sector has a clear interest in staying in business and surviving during and after natural disasters such as typhoons, which do not discriminate but impact all levels of society including the commercial organizations themselves. Hence, greater involvement of private sector organizations, particularly in the preparedness phase, would be of significant mutual benefit (Van Wassenhove et al. 2007; APEC

2010). The model for engagement of local population proposed by Sheppard et al. (2013) takes care of centralized control, but that centralized control is now given to the local disaster management authority, and the control at the national level is only for more strategic aspects. The local disaster risk reduction authority would develop and operate logistics clusters with membership including representatives from local government organizations, NGOs, utility suppliers, emergency services, and others. To avoid duplication specific functions would be allocated to cluster members based on their particular areas of expertise.

6.2.3.5   Civil Contingencies Agency Management System

Nilsson et al. (2010) present the civil contingencies agency management system for disaster management. This approach is borrowed from the practices of Swedish Rescue Services Agency (SRSA) that as part of its normal duties also executes humanitarian aid and rescue operations. This approach is different from the approaches followed by NGOs or other relief organizations. The important point to note about the approach of SRSA is its ability to scan its register or operative personnel and place specific competences at a mandatory organization's disposal. The operative workforce is employed for specific operations and a limited time period, during which they are on leave from their regular workplaces (Nilsson et al. 2010).

SRSA's approach is developed with two main underlying rationales: efficiency and humanity. Efficiency applies to optimal goal fulfillment, and humanity comprises a respectful and sympathetic attitude toward those who suffer and toward the organizations' own people as well as those from other organizations. When the efficiency aspect is directed toward person-related qualities of the operation, the emphasis is on a high level of professional task-related knowledge, both concerning the personnel of the management system and the operative workforce. This would mean having the required support (staff) units in terms of competences/experiences, being able to detect which operations are viable in terms of political intentions and financial opportunities, having operative personnel with the skills requested by mandatory organizations, being confident that operative personnel meet high standards, and being able to sell one's own competences to potential mandatory organizations (Nilsson et al. 2010). When efficiency aspect is applied to administration and logistics, the emphasis is on the availability and quality of required resources during different phases of an operation. In such situations procurement laws are not considered, as the requirements are very urgent.

Similarly, when the humane aspect is directed toward the person-related qualities of the operation, the management relies on the staff to have good social/ cultural competences. Such attitudes are imbued among the personnel before the operation needs to be carried on. This is important as personnel need to work in different cultures and an understanding of these cultures is required to provide humanitarian aid to the affected people. When the humane aspect is directed toward administration and logistics, the sociocultural atmosphere of the operational

environment should be taken into consideration. A humane environment is the one in which the needs of the help recipients and the helpers take priority over fixed routines. It is also an environment with a convivial atmosphere.

Finally, an effective management system of operative personnel both during normal period and during disaster is essential to provide humanitarian aid effectively in this system.

6.3 Conceptual Framework

As discussed the various approaches for coordination during disaster are beset with some issues. However, a common factor among all these approaches is the need for a centralized agency that can coordinate all the activities. Even in cluster approach, which recommends independent clusters for various sectors, the need for a coordinate organization is felt deeply. Thomas and Fritz (2006) propose a framework, which discusses about various kinds of partnerships that a nodal relief organization may enter into for efficient management of disasters. Since disaster relief efforts are clogged mostly by unsolicited supplies, establishing partnerships can help resolve such issues to a large extent. Figure 6.2 summarizes their partnership approaches.

As shown in Fig. 6.2, the four types of approaches are single-company philanthropic partnership, multicompany integrative partnership, single-company integrative partnership, and multicompany integrative partnership. The approaches are based on the number of companies partnering for an alliance with relief agency and the level at which they participate. The level of participation can be considered as a spectrum, one end of which is where companies collaborate to provide cash, goods, and services during the disaster and the other end of the spectrum comprises where companies collaborate to benefit from each other's core competencies. When a single-company allies with a relief agency at a philanthropic level, such partnership is termed as a single-company philanthropic partnership. An example of such an alliance would be the partnership between World Vision and 3M whereby 3M provides first aid supplies, stethoscopes, and respirators. Similarly, Abbott laboratories have partnered with the American Red Cross to provide a variety of products from antibiotics to baby food in the event of a disaster. The problem such partnerships face is that a single company may not be able to fulfill the requirements of a relief agency.

This gives rise to multicompany philanthropic partnerships, whereby a number of companies can join together to form a consortium that could fulfill the requirements of a relief agency. The disaster resource network (DRN), a creation of the World Economic Forum, is a good example of such partnership. DRN facilitates corporate donations during a disaster by matching the resources of company donors with the needs of humanitarian agencies with which its individual members have relationships. DRN helped solicit assistance from its member companies to provide required donations during the Hurricane Ivan, which left 60,000 people homeless on the Island of Grenada in 2004. The challenge in such partnerships lie in verifying

No. of Companies ↑	**MULTI-COMPANY PHILANTHROPIC PARTNERSHIPS** Companies join together in a consortium with other companies to provide supplies and services to many member aid agencies during a disaster Benefits: A consortium can fulfill the needs of relief agencies during a disaster Issues: Difficult to verify the capabilities of local charities, making sure that the needs of each member agency are clear to corporate donors and ensuring that companies respond in a timely manner. Also difficult to have an agreement among consortium members on the type of disasters and agencies that qualify for assistance.	**MULTI-COMPANY INTEGRATIVE PARTNERSHIPS** Brings to bear the collective resources and best practices of a number of companies to improve the disaster response capabilities for a whole range of agencies. Benefits: Harbors tremendous potential for disaster management and response Issues: Most complex in terms of execution, has a longer time horizon and generates fewer immediate payoffs for both corporations and the relief agencies.
	SINGLE COMPANY PHILANTHROPIC PARTNERSHIP Companies offer philanthropic contributions such as cash, goods and services to the agencies on the ground. Partnering with the relief agencies make the execution of philanthropic contributions easier. Corporations choosing this approach are advised to establish a clearly outlined donation process before help is needed. Benefits: Brings goodwill and positive publicity to both partners Issues: Single company may not fulfill the requirements of a relief agency	**SINGLE COMPANY INTEGRATIVE PARTNERSHIPS** The corporations and the aid agency take advantage of each other's core competencies to deliver assistance more effectively. Benefits: Brings a more systemic impact on the entire process of disaster response. Bring laurels to both partners. Issues: A change in one partner's brand may affect other's and it may be difficult to separate identities later, if desired. Detractors may question underlying motives of the corporation. Moreover, an economic downturn or change in top-management may jeopardize the partnership

Level of Participation →

Fig. 6.2 Partnerships for efficient disaster management

the capabilities of local charities, making sure the needs of each member agency are clear to the corporate donors, and ensuring that the companies respond in a timely manner. Moreover, consortium members must all agree on the types of disasters and establish a method of prioritizing the many requests for aid when an emergency occurs. Moreover, a large number of staff members are required to coordinate the same.

To address the systemic needs of a relief agency and not just the immediate concerns as in the philanthropic partnerships, integrative partnerships are formed whereby companies benefit from each other's core competencies. When a single company forms an integrative partnership with the relief agency, such a partnership mode is termed as single-company integrative partnership. The partnership between Dutch logistics giant TNT and the World Food Programme (WFP) is a good example of such partnership. Their partnership focuses on emergency response, joint logistics supply chain, transparency and accountability, school feeding support, and private sector fund-raising. The integrative partnership between TNT and WFP allowed TNT to use its existing infrastructure to get involved immediately and deeply in the relief efforts during the 2004 tsunami. The integrative alliance brought great laurels to both the organizations. The problem with such an alliance, however,

is that it may not work during economic downturns or changes in the structure of the top management. Moreover, people may question the motives of the single organization.

In the last form, a number of companies bring to bear their collective resources and best practices to improve the disaster response capabilities for a whole range of agencies. In terms of execution, it is the most difficult, but in terms of disaster management, it is the most rewarding. An example of such a partnership would be that of Partnership for Quality Medical Donations (PQMD), which was incorporated in 1999 to develop, disseminate, and encourage high standards in the delivery of pharmaceuticals and medical supplies for humanitarian purposes. PQMD provided relief efforts in terms of medicinal supplies in 2004 tsunami, and none of their relief efforts were found to be inappropriate by Pharmaciens Sans Frontieres in a 2005 investigation sponsored by the World Health Organization. The problem lies in terms of forging such partnerships as well as their execution.

All the above models have their pros and cons, although multicompany integrative partnerships yield the highest advantages in terms of disaster management and response. In what follows, we present an IT-based approach to forge such partnerships with a nodal firm that takes care of the disadvantages of the abovementioned approaches.

6.4   IT-Enabled Relief Network Model

Information sharing is at the core of coordination, and ICT has been widely used for facilitating information sharing within the network. Seybolt (2009) argues that information sharing can help overcome the three major obstacles of constraints on network development, namely, the sudden, massive workload following a crisis, the need for trust among the partners, and the political interests of certain actors. The United Nations World Food Programme, for example, utilizes an information and communication technology-sharing network that is based on SAP's commercially available enterprise resource planning software and that permits the global real-time connection of actors in the chain at different levels to share information that is relevant to ongoing projects and current situations. The information and communication technology-sharing network involves a telephone network (FoodSat) that permits free remote calls from any WFP office in the world and a radio network that is used to contact staff in the field (Cozzolino et al. 2012).

Based on the discussion of various types of approaches to coordination and the conceptual framework, we present the IT-enabled relief network model as shown in Fig. 6.3. The IT-enabled relief network model is based on collaborative partnerships where partners are supplying cash and other goods as necessary to the relief organization, which may use that money to purchase goods from suppliers. This approach uses ICT for coordination and uses the advantages of various approaches to coordination. This approach is similar to the civil contingency agency management system as practiced by SRSA except that ICT is used extensively for coordinating across various stakeholders and partners in the network.
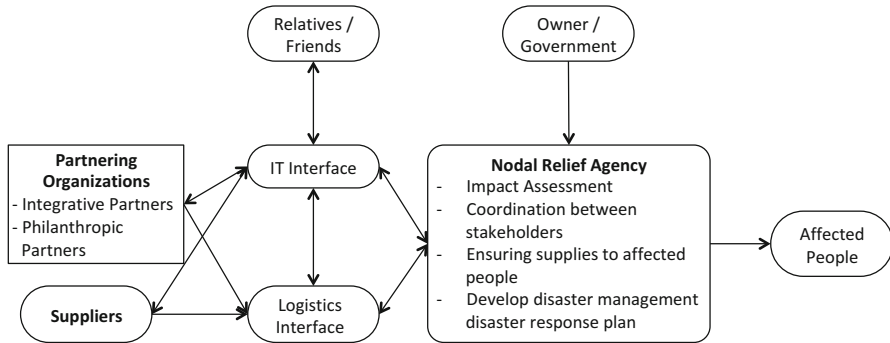
Fig. 6.3 IT-enabled relief network model

To understand this model, we must first establish the underlying principles. These principles are as follows:

(i) Relief efforts call for a selfless approach and are not meant for promotion or brand building by any organization, although in providing such efforts, companies may generate goodwill.

(ii) The nodal relief agency must be an authorized agency, preferably a government agency, and all the relief work should be done through such agency. This is similar to the concept of chain coordinator (Akhtar et al. 2012).

(iii) The government establishes such nodal agencies for prespecified areas prone to disaster. The authority/decision making for each area is vested with the local government who also takes responsibility for training the local population for dealing with disaster.

The IT-enabled relief network model takes advantage of various approaches to coordination and can be described as a multicompany integrative partnerships in terms of the framework proposed by Thomas and Fritz (2006) as summarized in Fig. 6.2.

This model takes advantage of various approaches and blends them together using an IT interface. The model requires integrative partnerships between various corporations interested in participating in disaster management and recovery and the nodal relief agency as authorized by the federal government of the country. The relief agencies are appointed for various areas (as in cluster approach) under the prespecified jurisdiction, and when a disaster falls in the border of various relief agencies, the underlying principle of selfless approach is called forth. These relief agencies then coordinate during disaster recovery. The problem of coordination between various corporations and the relief agency is addressed by having an IT system that helps collaboration between these organizations. The nodal relief agency raises its requirements which are displayed on its IT interface, and various corporations present their interest in either helping as an integrative partner in forging long-term partnerships or helping in a philanthropic manner by providing basic amenities as needed by the nodal relief agency. The interested parties need to register themselves with the nodal agency through their IT interface. The

agreements describing the extent of help are also established online. Thus, both philanthropic and integrative partners can express their interest online. An IT interface can be provided by another integrative partner, who is willing to provide its expertise during disaster management and recovery. For example, Google may consider integrating its people finder service in the IT interface of the disaster management organizations. The data thus remains with the government itself and is less prone to misuse by third parties.

The provision of help provided by philanthropic and integrative partners is done through logistics interface. Like the IT interface, the logistics interface may itself be developed by an integrative partner, who takes care of all logistical needs during the disaster because of its expertise. The logistics interface helps in streamlining the flow of necessary goods to the disaster-affected areas. Since the donating organizations are required to register with the nodal relief agency through its IT interface, only the necessary and solicited goods enter into the logistics channel of the relief network thus preventing the logistics channel from clogging. The streamlined flow ensures smooth disaster recovery operations.

The nodal relief agency through its major integrative partners carries out the relief operations beginning with the impact assessment, followed by establishing logistics and communication channels. The IT interface provides a basic assessment of the needs and supplies required for relief operations as well as information about the loss of lives, animal stock, property, etc., due to disasters. A tentative approach to relief management is also provided through the IT interface so that people do not panic. Since, the period for disaster recovery is very short, an IT interface which could be customized for various disaster recovery effort must be kept ready with trained personnel who regularly update the interface. An authorized interface will provide authentic up-to-date information to the concerned people. The philanthropic partners are then called forth through the IT interface for providing necessary supplies (in terms of cash, food, medicine, clothes, and other supplies as needed by the relief agency). Various supplies can be called forth using cluster approach whereby integrative partners who deal in a particular supply form a cluster to supply the requisite quantity during disaster. The nodal relief agency remains the chain coordinator or cluster coordinator for improved coordination in the chain. The integrative partners or the registered philanthropic partners may provide necessary relief as and when needed, and this would prevent the delays that occur in government procurement. The well-established network of supplies, which supplies goods on payment, also provides quick replenishment of supplies provided the rate contracts are already established with them.

The inherent issues with various coordination approaches are taken cared of using the IT-enabled relief network model. The nodal agency is the chain coordinator as well as the cluster coordinator. The nodal agency makes sure through its IT and logistics partner that only the requisite goods enter the disaster-affected area thus preventing problem of choking of supply chain due to unnecessary goods arriving into the disaster-affected area. The nodal agency also ensures the training of the local population for dealing with disasters and developing local capacity for dealing with disasters.

6.5   Conclusion

This paper presents an IT-enabled relief network model to address the problems of disaster management and recovery. The model represents the multicompany integrative partnerships in Thomas and Fritz's (2006) framework, which carries the maximum potential for disaster response. The biggest problem of coordination in such partnerships is addressed by using ICT, which also helps in coordinating with the friends and relatives of those affected by the disaster. The model ensures that only requisite products reach the beneficiaries and also prevents taking undue advantage by firms during a disaster situation. One problem that could be foreseen in such a model is of the ineffective, bureaucratic, and corrupt government machinery itself slowing down the process if the nodal agency happens to be the government. Still, we propose the local/federal government to be the nodal agency as private firms are driven by hidden motivations in their approach which need not necessarily be philanthropic.

The IT-enabled relief network model attempts to address the problem of coordination using IT interface and ensures a streamlined flow of supplies to the affected people. A well-established IT-enabled relief network would address the problem of coordination and allows philanthropic and integrative partners to provide support during relief operations. The model also allows sufficient time for nodal relief agencies to assess the competencies of its partners and work with them for capacity building in critical areas of disaster management. A number of people/organizations try to build business from ruins. The IT-enabled relief model provides equal opportunity to all organizations willing to participate in the relief effort as well as ensures that the participants get their due reward in terms of goodwill/recognition without clogging the logistics channel of the relief network. The government may consider this model for developing their disaster management strategy for the good of all the stakeholders concerned.

The IT-enabled relief network model is conceptual in nature and needs to be validated with its actual implementation or through cases of such management. Future studies can examine various cases of ICT-enabled relief management and integrate it with this model. Rudiments of such approach can be found in the international disaster management organizations such as the American Red Cross, which has developed capabilities in disaster management and recovery efforts.

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