

Disaster Relief Supply Chain Management: New Realities, Management Challenges, Emerging Opportunities

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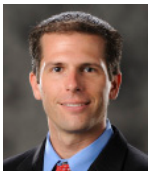
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At 4:53pm on January 12, 2010, the impoverished country of Haiti was struck by a magnitude 7.0 earthquake. By January 24, at least 52 aftershocks had been recorded. The effects of this natural disaster were enormous: at least 3,000,000 people were affected; between 217,000 and 230,000 people had died; an estimated 300,000 were injured; over 1,000,000 people were left homeless; some 250,000 residential and 30,000 commercial buildings had collapsed or were severely damaged. In response to calls for help from Haiti's President Préval, many countries pledged and/or delivered aid in the form of money, medicine, food, water, sanitation equipment, medical teams, engineers, and support personnel. The challenge: how to get these resources to Haiti—that task fell to the disaster relief supply chain.

The disaster relief supply chain operates under conditions that would frustrate most commercial supply chain managers. Different objectives and mechanisms drive disaster relief supply chains; their operating environment is extremely uncertain and dynamic, and unique management principles are often employed. Nevertheless, there are lessons to be learned that could apply to the most publicized commercial sector supply chains, such as those found at Wal-Mart, Toyota, Apple, and MacDonald's, and vice versa. Consequently, the purpose of this note is to introduce the disaster relief supply chain and to draw attention to the need for increased management research in the area. Surprisingly, little such work has been done by academic researchers thus far.

To underscore this lack of research, a search on Business Source® Premier of

scholarly journals yielded only one article on disaster relief supply chains. A search for articles on humanitarian supply chains turned up only five articles. Searching ProQuest® for dissertations and theses disclosed one for disaster relief and one for humanitarian supply chains. In this note, disaster relief supply chains are treated as a subset of humanitarian supply chains. Yet, there are important differences between the situation encountered by a humanitarian supply chain and those met by disaster relief supply chains. For example, disasters occur without much warning so little, if any, advanced information is available. Other humanitarian supply chains have some advanced warning or may even constitute a permanent ongoing activity, like food bank supply chains.

New Realities

Some researchers such as Michel-Kerjan and Slovic (2010)¹ have predicted that the earthquake in Haiti is only an omen of what we can expect in the future. They point out that more than half of the planet's 20 costliest catastrophes have occurred since 1970, due to (1) a world population that is quickly growing; (2) a larger concentration of assets (and people) in high-risk areas; and, (3) increasing social and economic interdependency. According to these researchers, these trends are combining to create an environment in which natural disasters are increasing in frequency and intensity. The data in Figure 1 make this quite clear. As if to emphasize this argument, during the two-month period following the Haiti earthquake, there was a more intense earth-

quake in Chile, and smaller ones in Taiwan, Turkey, and Los Angeles.

The devastation of the disaster in Haiti, plus the frustration with delays, congestion and suffering, underscore the need for more research on disaster relief supply chain management. Yet the earthquake in Haiti is only one example of a horrible natural disaster. The data in Figure 1 illustrates why there is increasing the demand for disaster relief supply chains. This data includes epidemics and man-made disasters like war, genocide, insurgency, arson, and terrorism. Each of these can overwhelm a local population and create human suffering. As territorial tensions grow and pressures on limited resources like oil, water, and arable land increase, there is no reason to expect a decrease in human-initiated disasters.

The forces described here are already stressing the world's capacity to respond to large-scale disasters. The United Nations and some forward-looking private companies have recognized this need. In an historic development in January of 2008, three third-party logistics providers (Agility, TNT, and UPS) signed an agreement with the United Nations to provide additional transportation capacity in the event of a large-scale international disaster.² Such help from the private sector will be called on with increasing frequency. The private sector's ability to contribute will depend, to a great extent, on its understanding of the unique management challenges of disaster relief supply chains.

Management Challenges

The disaster relief supply chain is very much a product of its environment. Consequently, it is very different from what most supply chain researchers and private company managers know. Practices that may work well in commercial settings may not be appropriate when dealing with disasters. Consider some of the critical management challenges typically encountered when deploying a disaster relief supply chain.

Command and Control Issues. Although the United Nations has a leadership role and prescribed procedures in the event of a major international disaster, the role of the government (at the national/state/provincial/local/tribal levels) must be recognized.

No international action can take place if the local government does not request it. When cyclone Nargis hit Myanmar (Burma) in 2008, the military junta refused to grant permission to some organizations to enter the country with aid. French and United States ships with aid supplies were anchored just offshore for more than two weeks before finally leaving. Even when permission is granted, there are still occasional conflicts of authority and delays in decision making, due to distance, communication impediments or misunderstanding. In the private sector world, there may be delays in decision making, but conflicts of authority are very unusual even across great distances.

Supply Chain Formation. The specific organizations that are assembled for any particular disaster is a function of severity, location, the nature of the disaster, availability of potential participants, anticipated needs and prescribed procedures. For instance, when delivering aid in some regions of the world, cargo security is a significant issue. In other regions logistics alternatives may be limited due to strained relationships between nations. In others, some well-qualified organizations may not be permitted to enter the country or traverse a specific country or area en-route. Thus the relief group's membership could change from one disaster to another, adding an extra dimension of complication to the

coordination. New supply chains are formed in the private sector as well, but that occurs most frequently with anticipation of the changing needs of the customers and/or the relief group members.

Donor Independence. A disaster relief effort often relies upon donor organizations to provide the goods and services needed for responding to the disaster. During the initial phase, when speed in getting these supplies to the disaster area is important, food, water, shelter, and medical supplies are usually the highest priority. As more specific needs are identified, supply chain managers can make more precise requests; however, what they receive is often determined by what the donors decide to provide. Moreover, some donors restrict where and how their resources can be used. In contrast, it is hard to imagine a situation where a private sector firm is sent a truckload of items that the supplier thinks is appropriate (or simply has on hand) but which do not satisfy the needs of the recipient.

High Uncertainty Levels. Disaster relief supply chains function in the presence of high levels of uncertainty about disaster timing and location, victims' needs, donors' supply, infrastructure, and even relief group membership. In a post-disaster environment, some information is simply not available while other information may not

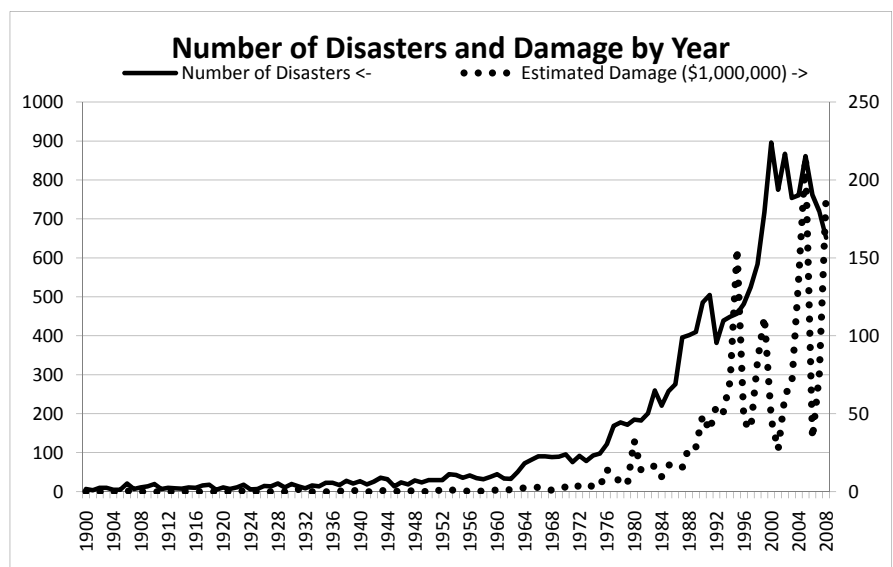


Figure 1: International disasters and damage. (Source: <http://www.emdat.be/database>)

make it to the organizations that need it.³ As a case in point, the recent earthquake in Haiti was totally unexpected, even though the country has several tremors every year. In addition, the epicenter was within 15 miles of the capital, Port-au-Prince, devastating residential and commercial buildings as well as communications and transportation infrastructure. With the public telephone system out and cellular service reduced (and in some cases non-existent), it was difficult to determine victims' needs and communicate to donors what supplies were needed and where. When information about the specific location of needs began surfacing, the compromised infrastructure significantly increased the difficulty of getting the right supplies to where they were needed. Examples like Haiti make it clear that the magnitude of uncertainty faced by managers of a disaster relief supply chain is significantly greater (at least in scope) than what is typically faced by a private sector firm's supply chain.

Shifting Overall Priorities. During the initial stage of a disaster relief operation, responding just after the disaster has occurred, the critical performance attribute is that of speed. Most importantly, speed can translate into a reduction in lives lost and in human suffering, but it is required in the face of high demand uncertainty. Consequently, relief organizations often "push" available supplies into the disaster area as rapidly as they can. Yet, speed is difficult to attain for several reasons, including securing adequate supplies, finding sufficient shipping capacity, and getting to the disaster site. Experience, inventory availability, and capability dictate what will be moved, not knowledge of needs. Within days, as infrastructures are stabilized and people are moved out of harm's way, the supply chain quickly shifts to focus on efficiency in long-term recovery efforts. It becomes more demand-driven, using information about damage and needs, to "pull" supplies to the victims.⁴ Private sector firms may also need to change their supply chain priorities over time, but rarely so quickly and radically as a disaster relief supply chain.

Changing Operational Needs. Not only do the priorities change over time, but the local conditions are highly dynamic as well. This situation requires different responses, resources and capabilities. For example, as the airport in Port-au-Prince became operational, setting priorities on incoming supplies became more important than finishing up the work on the airport control tower, particularly supplies which might help locate and rescue people still trapped under collapsed buildings. Local managers coordinated decisions as best they could with the many other organizations in their area. This type of situation gives rise to a shifting tension between execution (responding to the needs and worrying about the compliance with regulations later on) and compliance (making sure that actions are done in accordance with the appropriate procedures and regulations). Again, it is rare that a private sector supply chain would face such a dynamic operational environment.

Supply Chain Evolution. Shifting overall priorities and changing operational needs can lead to changes in the supply chain. As an example, during the relief effort in Myanmar in 2008 after cyclone Nargis, the transportation (road, port, and airfield) and warehousing infrastructure was badly damaged. So a receiving point was established in Bangkok, Thailand. When the military junta finally gave permission for the aid to start flowing, road transportation was used to get aid into Myanmar until ships that could get into the country were obtained, roads were repaired, warehouses made available, and the airport was reopened to cargo. During the time these physical changes were taking place responsibility was shifting between organizations, and more Burmese were being incorporated into the effort. All these changes occurred in a matter of a few weeks. This is a typical example in that the organizations, responsibilities, transportation routings and carriers, personnel, and other elements of the supply chain changed, often frequently, to meet changing conditions. Certainly, commercial supply chains evolve as changes occur in the customer base, the product line, supply base, or other conditions, but seldom with the rapidity of disaster relief supply chains.

Self-Initiated Participants. Following a disaster, it is not uncommon to encounter a number of uninvited or unexpected individuals, groups or even newly formed organizations attempting to help in the disaster relief mission. While they are usually motivated by the best of intentions, these efforts can create numerous problems. For example: (1) they compete for coordination, communication, logistics, and sustenance capacity like everyone else; (2) they often need more coordination effort since they did not participate in any prior planning efforts; and (3) they often disrupt the efforts of others. Their presence creates what can be best described as turbulence that complicates the supply chain management task. In the private sector, it would be odd to see a large number of unanticipated firms integrate so quickly with an existing supply chain.

Press Coverage and Publicity. When a significant disaster occurs, people everywhere are interested. Consequently, the advent of a disaster is usually accompanied by the arrival of the press. In the 2005 Hurricane Katrina, for example, the press was covering the inside of the Super Dome before the relief effort even got there. The presence of the press creates its own set of costs and benefits. It can, for example, seize resources needed for disaster relief. In Haiti, the press competed for valuable airport space and supply chain managers' time. Furthermore, the press can direct attention towards breakdowns or problems with the performance of the supply chain. The press was instrumental in uncovering the various problems encountered by FEMA in responding to and dealing with the effects of hurricane Katrina. On the other hand, the publicity arising from coverage of a charitable organization on site in a disaster can help generate donations. But this often leads to competition for press time among the participating organizations and can create coordination disincentives. Even though publicity is usually of value to a firm, such press attention is typically not showered on the private sector (sparing them the scrutiny and management time).

Post-Disaster Relief Activities. After the urgency of the initial disaster response and the creation of conditions in which the affected population is safe, the focus turns to restoration of the country(s) infrastructure. For instance, the press and President Préval of Haiti are already talking about the reconstruction of Haiti. It may not be possible to return to the conditions that existed before the disaster, but moving towards normalcy is important for the victims. The implication of this is that the restoration phase needs to be explicitly considered during pre-planning and execution of the response to the disaster. Explicitly taking into account the restoration phase during early planning could avoid some of the problems that arise after a disaster. As an example, using chemicals to extinguish the recent forest fires in California instead of water might have reduced the damage from the mudslides that occurred afterwards. Commercial supply chains do consider how to accommodate customer returns and have reverse logistics systems for end-of-life products (especially in Europe) but this is a fairly new initiative.

This brief list of management challenges is not intended to be exhaustive. Rather, it is constructed to point out some of the areas where management challenges exist in disaster relief supply chains and to invite academics and scholars to explore these areas, where opportunities exist for additional management research.

Emerging Opportunities

It now should be clear that disaster relief supply chains operate in a different environment from the types of supply chains that are more widely known and researched. These differences are important and offer opportunities to conduct potentially useful research. One obvious reason why studying disaster relief supply chains is important is because of the potential to save lives and reduce suffering for those people affected by a disaster. Another, less obvious, reason is that there are lessons to be learned for the private sector. The study of such highly responsive supply chains could help inform other contexts in which a growing importance is placed on customer responsiveness and product innovation, contrasted with

cost and efficiency (see Melnyk, Davis, Spekman, & Sandor, 2010,⁵ for a more detailed discussion). Moreover, increasing the breadth of supply chain research will help in developing classifications, identifying drivers of attributes and uncovering transferable practices than can benefit other sectors.

Although there has not been a great amount of management research on humanitarian and other “non-traditional” supply chains, interest is increasing and more is being published.⁶ There are requests for a special issue of the *International Journal of Production Research*⁷ and a new journal in Europe⁸ is devoted to the topic. Sessions have been held at the Decision Sciences Institute annual meeting⁹ and more are planned. In addition to the intrinsic value of studying disaster relief supply chains, such studies can add to supply chain management knowledge in general. The more that can be learned about effective practices in supply chain responses to different needs, the better the designs of future supply chains can be. Hopefully, this note will motivate some of you to seriously consider studying the problems and challenges facing humanitarian supply chains, submitting papers for publication, and attending sessions at the annual meeting. ■

Endnotes

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6. Boin A., P. Kelle, and D.C. Whybark, “Resilient Supply Chains for Extreme Situations: Outlining a New Field of Study” Special Issue of *International Journal of Production Economics*, forthcoming.
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8. *Journal of Humanitarian Logistics and Supply Chain Management*.
9. See, for example, *Humanitarian Supply Chain Management*, Sessions SC-7 and SC-9, DSI Annual Meeting Proceedings, 2009.

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travel, dining out, theater, musical comedy, and the symphony. My wife, Leslie, and I spent many years going with Helen to local theater groups and the San Diego Symphony. Helen never said no when I suggested an event to attend. When her knees finally gave out we just modified the seating arrangements and choice of restaurants so that access was easy for her. Helen was always a real trooper. We continued enjoying theater, dining out, and the symphony up to just a few months before she passed. In her 94 years, Helen truly experienced a full life with experiences in the early days of radio and television in San Francisco and Los Angeles, in the Red Cross in World War II, and at San Diego State. She came to San Diego State when she was insulted by the salary that one of the local TV stations offered.

At many of the regional meetings Helen always amazed me with her uncanny memory. She could always remind me that someone had forgotten to sign the check that they had mailed to us, or had sent two checks long after these incidents escaped my memory. I truly believe that there was nothing related to her tenure as executive secretary of DSI (and the earlier AIDS) which she ever forgot. She always cherished her memories and friends which she made through DSI and San Diego State University. Her many friends will miss her, as do I.

—Howard Toole, Emeritus Professor of Accountancy, San Diego State University