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# Transitional Challenges of Information Flows in Humanitarian Supply Chains

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## Transitional Challenges of Information Flows in Humanitarian Supply Chains

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### Abstract

*Transitions across the Disaster Management Cycle are challenging. The product flows between immediate relief phase and rehabilitation and recovery phases often dip due to poor transitions of communication and information systems between partnering donors. The information flows are the crucial link that could ensure that the robustness of the supply chain into a disaster area is maintained. The lack of systems connectivity is a major element preventing product flow robustness. The purpose of this paper is to highlight these challenges and to provide a framework that could be implemented to prevent such pinch points. Resilience of humanitarian supply chains during transition periods depends on information flows to enable smooth changes to occur.*

### Keywords

Information flows, humanitarian supply chains.

## INTRODUCTION

The concepts of e-commerce and e-logistics in humanitarian aid are relatively new. Electronic logistics (e-logistics) uses IT from software applications, databases, warehouse and transport management systems, RFID and other tracking systems. E-procurement refers to the connections of all procurement activities such as purchasing, ordering, payments and authorisations between suppliers and buyers. The use of Cloud based storage, cyber collaborations, e-marketing and network planning as well as operations management and research all constitute e-supply chain management (e-SCM). Network infrastructures, platforms and operating systems all comprise the very recent use of e-SCM. The integration of these systems and processes provide visibility and smoothness of the physical product and financial flows of supply chains. In the arena of humanitarian logistics, especially in third world countries where many disasters occur, the use of e-SCM is still emerging.

This paper highlights some of the key challenges facing the emerging e-logistics usage in humanitarian logistics and provides some guidance to meet these challenges. Recommendations are proposed that range across the total disaster management cycle to improve the information flows in the various phases and through the transition periods between phases.

## THE DISASTER MANAGEMENT CYCLE

The disaster management cycle can be depicted by a cyclical model as shown in Figure 1. This model depicts the immediate relief phase, the recovery and preparedness phases. It highlights the shortness of the immediate impact phase where immediate relief is urgently required and then shows the extended time periods of the transition, recovery and prevention stages. These phases comprise various elements as shown, for example in the recovery stage to incorporate the restoration, rehabilitation and reconstruction phases.



Figure 1: Disaster Management Cycle (Safran, 2003)

Safran's model does not depict timelines nor does it show that the developmental aid, prevention and preparedness activities are ongoing and link to the resilience of the immediate relief and recovery phases. From this early cyclical model a linear model is devised to highlight the transitional areas and their importance.

Figure 2 shows a linear view of the disaster management cycle with a broader phase approach of disaster relief comprising Phase 1, recovery, restoration, rehabilitation and reconstruction all combined into Phase 2 and then the handover to the host nation as Phase 3. Levels of logistical support are shown on the vertical axis and a broad time line is shown on the horizontal axis. Beneath the horizontal axis is shown the multitude of institutions involved in providing logistical support (indicated by the white arrows). Each institution such as the logistical clusters, Red Cross and NGOs and government organisations and military organisations all have different organisational goals, strategies, leadership styles and cultures. These institutions also have different strategic, tactical and operational and communication levels.

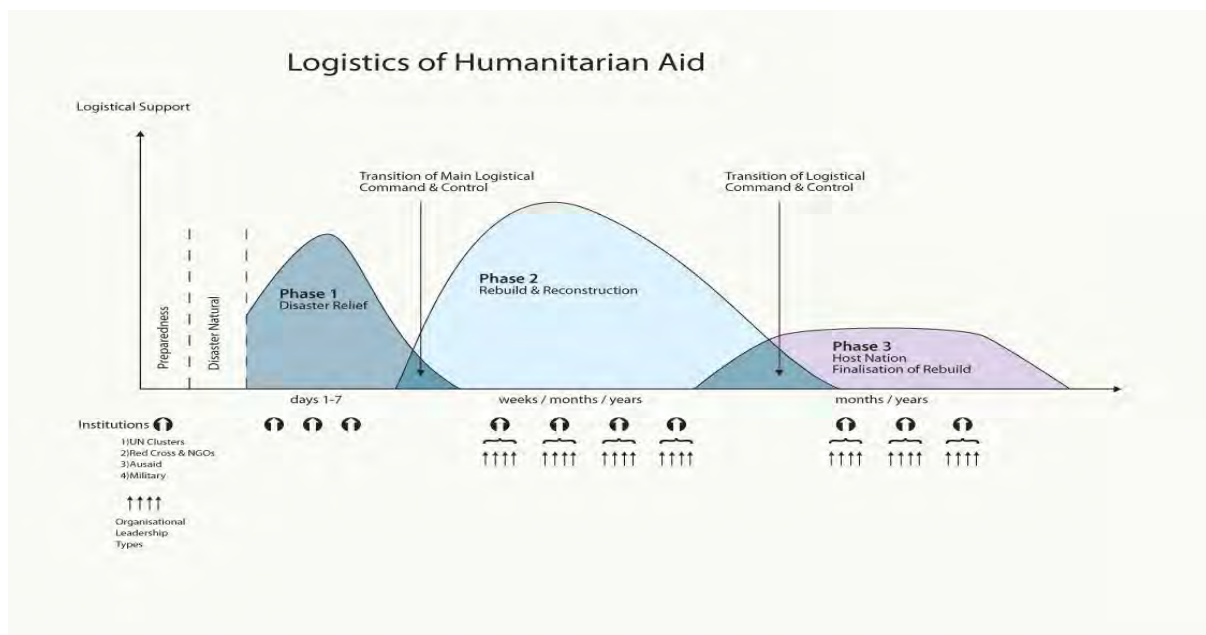


Figure 2: Humanitarian Aid Logistical Phases (Authors)

Collaboration between organisations plays a major role within each phase, especially during the transitions between phases. Networks of a multitude of separate supply chains supporting various agencies, international organisations, United Nations and non-government organisations flow into the immediate relief area of the disaster zone. The choke points of the entry ports to the disaster zone are where collaborative networking is crucial. Visibility, network risk, resilience of networks and continuity of communications and internet systems plays a crucial role.

It is not only the entry points into disaster areas that impede the physical product flows; it is also the increasing prevalence of large scale humanitarian crises in urban settings experiencing high congestion levels that impede physical flows. Both physical product flows would benefit from great visibility and integration information flows.

Disruptions to the logistical physical flows are shown during the transition phases. As the different information systems do not integrate well due to changeovers, lack of visibilities, different operators and different systems take over different product inflows.

The dip in logistical activities and support between Phase 1 and 2 is a gap that can be rectified with closer collaboration and connectivity of systems. The logistical support rapid fall in end of Phase 1 and a similar rapid rise in beginning of Phase 2 indicate the transition of different players and thus different product flows and different information flows of different supply chains. The exit strategies of civil-military agencies providing the immediate relief of sustainment humanitarian kits, emergency rehabilitation equipment and health and medical equipment for the survivors quickly take place demonstrating the steepness of the fall of the curve ending Phase 1. As can be seen the logistical support is severely decreased during this transition period. The overlap between the logistical support during Phases 1 and 2 needs to be minimal but the logistical support needs to be maintained to enable the smooth transition from one phase to the next. Visibility and e-connectivity of systems during and between phases as well as between the different agencies operating in these phases will permit a smoother robustness of logistical support during transition.

Difficulties of connectivity of systems between the exit of the humanitarian aid agencies and the transfer of logistical activities to the host nation are also problematic from the logistical systems perspective. Typically global agencies such as the United Nations organisations, global NGOs such as the World Food Program, Red Cross and Red Crescent have sophisticated logistical systems that can operate globally. Many third nations do not have the sophistication of these global supply chains. The inflows to the host nations will fall as the host nation takes over the continual preparedness stages of the disaster management cycle.

Figure 3 demonstrates the business supply chains comprising in the broadest sense, suppliers, manufacturers, distributors and retailers, each with associated tiers of supporting logistical industries. These broad supply chain participants are termed 'the participants'.

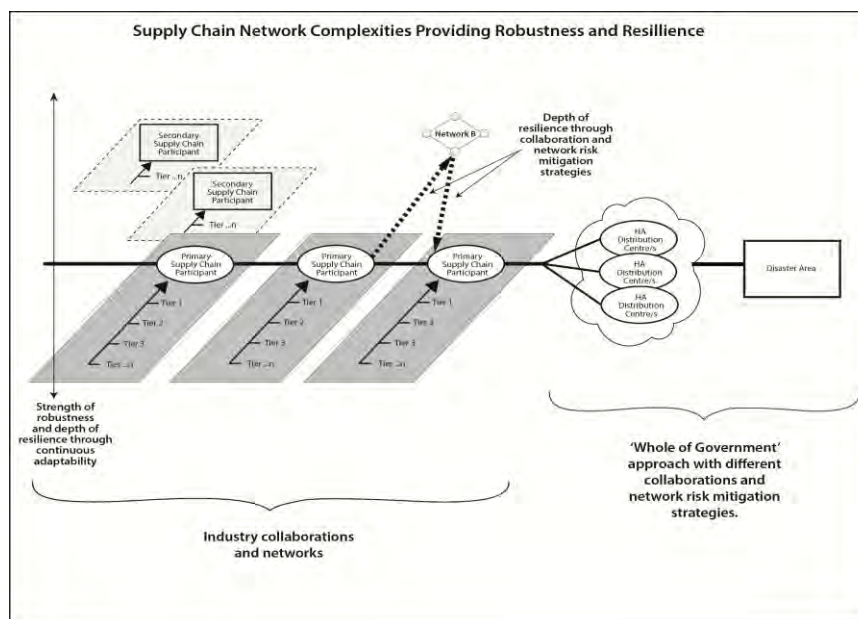


Figure 3: Transition from Business to Humanitarian Supply Chains (Authors)

When disruptions occur in these business based supply chains outside the disaster area the various participants will implement reactive resilient strategies to minimise the disruptive influences. The business end of the global humanitarian supply chains can adapt and react to disruptions by implementing alternate routes; alternate sources of supply and alternate information and financial systems. Typically the demand and supply flows and collaborative arrangements with supply chains organisations are strongly embedded in their B-to-B risk management activities. Participants along supply chains are increasingly applying alternative business to business exchange models of deliveries and payments. 'Full service contracts' and close collaboration are typified by comprehensive bundles of products and services (including information and financial services) that are required by the customer for specific events or equipment providers. (Lay et al, 2009)

Substituting the humanitarian area of operations as the 'retailer' participant of a business supply chain, a crucial point is the entry point to the disaster area. At this point the inflows of physical, information and financial systems collaborate with non-business organisations that are typically uniquely developed to support the explicit disaster area. The humanitarian aid organisations involved all have the shared strategic goals of support and assistance. The efficiency strategies predominant in business supply chains change to responsiveness strategies. The systems used in business environments have to adapt to the harsh environments of disaster immediate relief areas where communication and financial systems may have been destroyed. The change-over of information systems based in business environments where visibility and accountability are well established, enters a new set of systems which are often transitory, unique to the disaster and comprising many different participants. The recently established cluster systems and the creation of OCHA as a coordinating body for humanitarian logistical services have smoothed this change-over connection point between business to humanitarian environments to some extent, nevertheless the information systems still to not integrate fully and thus visibility is only partial of the physical, information and financial flows.

Links to accounting systems and visibility and understanding of financial flows are viewed as a key capability of humanitarian logisticians (Kovacs, et al, 2012). Visibility within cluster systems within humanitarian zones can be extremely complex. The IASC cluster system in response to 'shelter' needs in the immediate relief phase after the 2010 earthquake in Haiti was divided into four different clusters. With each of these clusters were numerous sub- and inter-cluster working groups providing logistical aid. The fragmentation of the shelter and housing within the cluster system distorted and worsened the integrated communication systems and the complexity made planning and visibility of supply minimal. (Pantuliano, et al, 2012) The vast complexities of services, operations and interdependencies that comprise complex emergencies and humanitarian disasters overwhelm host nation responders and depending on levels of corruption, kinship, political and cultural displacements will also overwhelm the information systems of the global aid providers. The resilience of the information systems is crucial to enable more robust flows into disaster areas across all phases of the disaster management cycles.

The continuous adaptability providing greater resilience of a supply network can be supported by risk mitigation strategies that involve 'everyday' competitive industry collaborations and networking. Nevertheless sometimes the supply chain, especially under surge capacities of humanitarian immediate relief supply chains might experience a strong turbulence which requires some of the participants to collaborate outside their immediate industry network which is shown in Figure 3 as network B. The impact on the disaster area could be catastrophic if the total supply chain information networks and collaboration are not working. It is argued that the maintenance of robustness within the 'last mile' distribution into the disaster area rests on the resilience of the total supply chain supporting it outside the disaster area. The down-stream parts of the inflowing supply chains need visibility to flows and hold-ups in the disaster area so that physical product flows can be held back or pushed forward as needed to ensure robustness of flow of the physical products. Resilience in supply chains should be under a holistic approach. This includes the total supply chains and its many elements consisting: (a) the extent and level of disturbance along the total supply chain; (b) the rapidity or pace that each participant experience some disturbance and the rapidity that the particular participant and the total supply chain will restore itself back to a stable operational state, and (c) the degree the new steady state of operations differs from the original steady-state (in either better or poorer levels of operations given the conditions). Figure 3 emphasises risk mitigation strategies to improve resilience in the supply chain from an industry perspective. These sections of the supply chain and collaborations and development of networks need be the focus of planning in the preparedness phase of the DMC.

Figure 3 emphasises the requirement of totally different forms of collaboration and network developments transitioning from the 'business' supply chains reaching the entry terminals and into the disaster area. In commercial and industry supply chains the overall goals are profit but profit is replaced by speedy or timely distributions of the required relief goods in the immediate relief phase. The transition of collaborative goals from the commercial associations to the humanitarian collaborative goals can occur at the point where the agencies pool resources, preposition relief items and various forms of postponement. Collaborations and co-ordination issues alter markedly yet supply chain operations occur in environments that are often hazardous, changeable and

lacking clear leadership and control. OCHA has been established to assist these changed collaborations and support closer communications. Recent technological innovations enable e-commerce and real time communication flows throughout humanitarian supply chains which improve visibility, accountability, adaptability, flexibility, traceability and both the physical and financial efficiencies and effectiveness. The following section demonstrates three core strategic areas where e-logistics in humanitarian supply chains currently experience distinctive challenges.

## **STRATEGIC FRAMEWORK FOR E-BUSINESS SUPPLY CHAINS**

Product, information and financial flow oriented innovations along the supply chain have received scant attention in the supply chain literature. There are many challenges facing the use of e-logistics in humanitarian aid. This section attempts to classify these challenges based on strategic options, namely logistic services, collaboration and diversification of the humanitarian space.

### **Integrated Logistics Services**

Agility in humanitarian supply chains is necessary for the successful operations in uncertain and ever-changing environments. The distinct dimensions of agility include alertness (the ability to quickly detect changes, opportunities and threats), accessibility (the ability to access relevant data), decisiveness (the ability to make decisions resolutely), swiftness (the ability to implement decisions quickly) and flexibility (the ability to modify the range of tactics and operations to the extent needed) (Gligor et al, 2013.) To achieve even partial agility in humanitarian supply chains close collaborative information flows are required. Agility needs visibility.

As business logistics is receiving increasing recognition as a competitive parameter, the focus is shifting to more strategic considerations of service response and flexibility instead of simple make-or-buy decisions (Bask *et al.*, 2010; Skjoett-Larsen, 2000). Applying this to humanitarian logistics better efficiencies and effectiveness can be achieved by focusing on research relating to humanitarian logistics across all disaster management phases. First, the outsourcing of logistics services is expected to increase; second, the logistics service industry is an emerging industry in the humanitarian space with logisticians being professionals rather than the previously unprepared volunteers being used for logistical tasks. This promises a positive future and new roles in supply chains and value networks for the logistics industry. Thirdly, value added logistics services seem to be the fastest growing part of the transport and distribution industry. Moreover, as highlighted by Skjoett-Larsen *et al.*, (2007) e-commerce has created major changes in the structures and processes of distribution. To summarise, in the future, logistics service providers are likely to continue to strengthen their value creation in supply chain networks both at the global and local levels.

Reflecting on these applications in humanitarian logistics it can be observed that information technology has enabled new channels such as online services, for example the UNHRD website facilitates purchasing non food items through real-time tracking of cargoes enabling customers to monitor their deliveries using data networks.

### **Collaboration**

The rate of adoption, the roles suppliers play in the adoption processes and the strategic alliances and extent of visibility revolve around an interrelated complexity that is accentuated in complex humanitarian supply chains. (Wuttke, et al, 2013) In humanitarian supply chains various options are available for e-supply chain management. Depending on the changes and speed of changes as well as the complexities of the changes occurring in supply relief, rehabilitation and recovery individual processes of different donor organisations can aim for continuous improvements in the longer term and process adaptations or improvements in the shorter term. Extensive scope changes across the end-to-end supply chain can be quite radical in the longer term due to extensive collaborations. In the short term reliance on process integration (and disintegrations in the exit strategies) of the current players can occur. (Chaffey, 2012) Partnering arrangements such as strategic alliances, long term contracts, standing offers, preferred suppliers, competitive tendering and spot markets and reverse auctions all lend themselves to long or short term options for humanitarian logistics.

Collaborative arrangements change over the total supply chain which initiates in the preparedness phase of the disaster management cycle with business supply chains developing products and kits which are produced under standing offers and contractual arrangements. The collaborations are long term and well integrated with information systems, visibility and similar strategic goals of supply chain efficiency. In times of disasters these alliances bring forth the required surge flows into the disaster area. Similarly many other organisations are pushing surge humanitarian products into the disaster zone. The visibility in the choked entry points are organisation based and does not typically extent across to inter-organisational systems. More efficient access,



scheduling, warehousing, distribution and transportation would occur with inter-organisational visibility during the immediate relief phase.

During the transition period between the immediate relief and rehabilitation and recovery phases many initial relief organisations such as the military exit but the exit strategies and processes are not well planned to ensure visibility and compatibility of information systems are retained. Such organisations as the Red Crescent change their contributions and transportation and access routes become established as well as warehousing and distribution services. Stability of demand and supply occurs and forecasting for required aid is more accurate which then establishes well known services that cover the physical product, information and financial flows. For example the predictability of 'tent cities of refugees' can be quite stable over a long period of time.

### **Diversification of the Humanitarian Space**

Adopting a downstream position, such as the provision of installed base services, organisations have to be service oriented and value services (Oliva and Kallenberg, 2003). These organisations provide solutions through product-service combinations and tend to be client-centric and providing customised, desirable client outcomes organised around particular capabilities competences and client requirements (Miller *et al.*, 2002). For example, WVI Canada has been working on a tracking and tracing system that they intend to offer to other HA organisations for a fee (WVI, 2012).

The cluster systems now being used in humanitarian services have led to closer collaboration and information system integration to a partial extent. The diversity of players in the humanitarian space make complete information integration impossible at present although more NGOs are offering each other service developments which in turn will further the integration of systems and their interoperability.

Each disaster bring unique circumstances which range geographically, technologically, demographically and culturally as well as the extent of the disaster and its impacts on the economy. Host nations and their beneficiaries of humanitarian aid may consider the diversity of sustainability of products, ranging from e-purchasing and e-products to standardised humanitarian survival kits. Social impacts will be less if local products are used if possible. The emerging use of micro-financing and e-finance depend on communication systems and thus in emergencies the telecommunication towers are one of the first assets to be reinstalled. This recent possibility impacts strongly on humanitarian supply chains in that each beneficiary can choose and pay for what they prefer which will in turn imply individual deliveries to customers.

Other diversification occurs in donor organisations. The military are often the first deployed (within 48 hours) with their quick deployments, agility, capacities and capabilities. They have their own secure information systems which integrate only on a minor scale with civilian or allied militaries. There is some development of common language and business processes across the logistical distribution systems. When militaries deploy with speed and agility they often use supply chains that only their capabilities can use. Thus exit strategies are becoming to be seen just as important as entry strategies. Handover information and communication co-ordination are necessary in these transitions to prevent the dips in the physical flows as shown in Figure 2.

The diversity of donor organisations, the needs of beneficiaries, types of disasters, locations, environments and economies of disaster zones all impact on the co-operation, co-ordination and collaboration of organisations and their compatibility and interoperability of information systems. Continuous adaptability and interoperability changes need to be continuously monitored to cope with the changing diversification of needs, players and recovery efforts in disasters.



## CONCLUSION

Interoperability, agility and visibility have been argued to be crucial considerations to improve the current humanitarian logistics services. Systems standardisation, similar to product and kitting standardisations are emerging and demonstrating their usefulness. Cluster approaches to logistics and greater professionalism is also improving visibility and integration of information systems. The future challenges associated with micro financing and individual ordering by beneficiaries will add further complexities. The increase of crises in densely urbanised areas will demand even great visibility of distribution services, congestion and choke points. Visibility across organisations, pipelines, warehouses and distribution and transportation flows will continue to improve but the rate of improvement may not be sufficient to keep abreast to the increased complexities of disasters.

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