

## Measuring Success in Humanitarian Supply Chains

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**ABSTRACT:** *What success entails in a humanitarian supply chain has not yet been clarified satisfactorily. Depending on the specific actor or stakeholder, definitions of success may be different. This research defines success factors and translates them into concrete indicators supported by a case study in two German and two Dutch humanitarian aid agencies.*

**KEYWORDS :** *Humanitarian supply chain, success factors*

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### I. INTRODUCTION

In today's environment the number of natural and man-made disasters increased significantly. Due to the climate change there will be more disasters [1; 2]. Thomas and Kopczak expect a steady increase of fivefold times for the number of natural disasters over the next fifty years [3]. In 2006 the United Nations also confirmed that the natural disasters over the next years become more severe, often and destructive [4]. In the Annual Disaster Statistical Review 2011 is reported that in 2011 332 natural disasters were registered. In 2011, natural disasters killed 30.773 people and caused 244.7 million victims worldwide. Economic damages from natural disasters were estimated US\$ 366.1 billion. The earthquake and tsunami disaster in Japan was the most expensive natural disaster ever recorded, with estimated economic damages of US\$ 210 billion. In June 2011 a flood affected China and has caused 67.9 million victims. Furthermore droughts and consecutive famines caused many victims in Ethiopia (4.8 million), Kenya (4.3 million) and Somalia (4.0 million) [5]. The increasing number of natural disasters and the resulting complex humanitarian emergencies put pressure on Humanitarian Aid Agencies (in following HAA) to deliver humanitarian aid in an appropriate and cost effective way [6; 7; 8; 9]. These are considerable reasons to work on determining the success factors of humanitarian supply chains. Success factors are critical for a successful operation of humanitarian aid delivery and for improving humanitarian supply chain efficiency.

Key success factors are also known as critical success factors [10; 11]. Key success factors are not key performance indicators [11]. Critical success factors are defined as those things that must be done if a company (a HAA) is to be successful [12; 13]. Key success factors have to be established for the overall organization for achieving objectives centered on financial, growth and positioning issues [10; 14] on the strategic, tactical and operational levels. Daniel proposed the concept of success factors for enterprises; these contribute to competitive success in the particular business. He adds that all financial and non-financial data within an enterprise (a supply chain) are needed to plan, operate and control an enterprise (a supply chain). This includes external information such as economic and political factors and data on competitive activities [15]. The key success factors concept is important to target overall organization goals and objectives; it should be measurable and controllable; it should focus relatively on only a few indicators; it expresses the things that must be done; it should be applicable to all organizations or companies with the similar objectives and strategies and it should be defined for overall organization, each organization unit in a hierarchical manner [10]. Key success factors have been determined for different management topics for example knowledge management [16; 17; 18], supply chain management [19; 20; 43], information technology [21], humanitarian relief and supply chain [11; 22; 23; 24], logistics [25; 26; 27], project and change management [28].

Key success factors are predominantly focused on profit sector; however, this body of knowledge is usable for HAA even if they are characterized as non-profit organizations. Therefore following research questions are derived:

*RQ1.* How are the objectives of HAA?

*RQ2.* What are the key success factors for HAA in a humanitarian supply chain?

*RQ3.* Why decisions or actions are keys to these success factors?

We used the existing literature to identify success factors for the humanitarian sector. The proposition of identified success factors based on literature is in itself not sufficient. Concrete key success factors are presented in an illustrative case study would help specific humanitarian supply chain actors in decision making and supply chain process management.

The paper started to present the necessity of identifying key success factors for humanitarian supply chains and defining key success factors. A Review of literature on key success factors in humanitarian supply chains is then offered to demonstrate the state of art in this topic. This is followed by presenting the research methodology in section IV and the findings in section V. The discussion shows the implications of the findings for HAA. The paper concludes by highlighting the implications for academia and practitioner and outlining future research for the development of key performance metrics and systems for the humanitarian supply chain field.

## **II. HUMANITARIAN SUPPLY CHAIN**

Generally a supply chain is a network of organizations that are involved, through upstream and downstream linkages, in the different processes and activities that produce value in the form of products or services in the hands of the ultimate consumer [29; 42]. Supply chain management is the management across a network of upstream and downstream organizations of material, information and resource flows that lead to the creation of value in the form of products or services [30]. However, the humanitarian supply chain encompasses the planning and management of all activities related to material, information and financial flows in disaster relief. Importantly, it also includes co-ordination and collaboration with supply chain members, third party service providers and among humanitarian organizations. It does not include the development of aid aspect of humanitarian logistics [31]. Further, humanitarian supply chain management is concerned with managing the efficient flow of aid materials, information and services and aim to reduce the impact of disaster on human lives [32]. Humanitarian supply chains play a central role in several phases of a disaster relief concept such as preparedness, immediate response, reconstruction and recovery phase [33]. Each of these phases and activities require logistics support, although every phase has its requirements with regard to the duration, volume, the needed relief items as well as the variety of supplies, urgency and procurement location. Considering this, efficient collaboration and cooperation between the varieties of supply chain actors is one of the main criteria for the humanitarian network design. Especially in sensitive phases such as the preparedness and response phase a high need of cooperation and collaboration can be noted. The following figure underlines the specific need, the logistics volume and urgency, the duration, as well as the variety of supplies and the procurement location change referring to the specific phase and disaster.

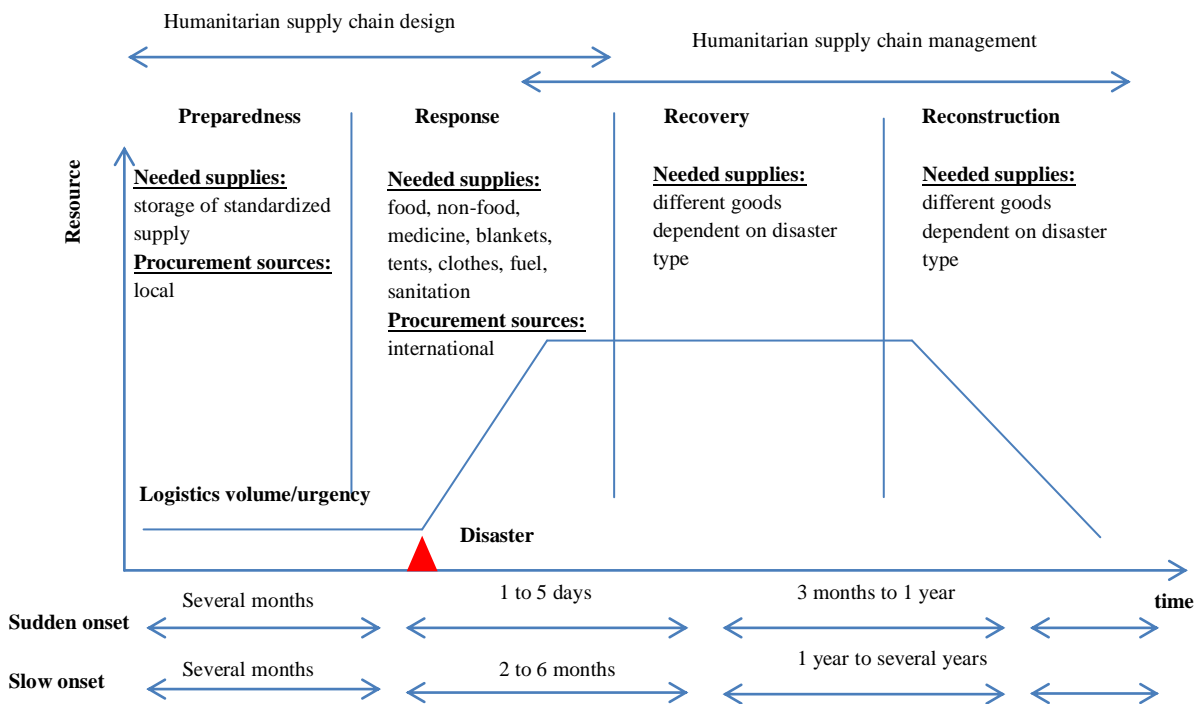


Figure 1: Humanitarian supply chain management cycle [33]

A humanitarian supply chain is dynamic, agile and innovative [8]. It can be seen as clearly unpredictable, turbulent, and requiring flexibility [8] because of complex environments due to the disasters that occur anywhere and anytime, unfortunately often in underdeveloped countries with poor infrastructure or political instability [34]. And hereby it can be argued that humanitarian supply chains need a combination of military and commercial application [7]. Due to this complexity, the analysis of key success factors is essential to achieve efficient and effective supply chains, to fulfil the donor and beneficiary demands as well as service requirements and to generate competitive advantages e.g. in quality of products.

### III. REVIEW ON KEY SUCCESS FACTORS IN HUMANITARIAN SUPPLY CHAINS

Compared to commercial supply chains, key success factors in humanitarian supply chains are rarely mentioned. The first work that focused on key success factors to humanitarian supply chains is of Lu et al. and Pettit and Beresford [22; 23]. The suggested key success factors in humanitarian supply chains of Lu et al. and Pettit and Beresford based on the work of different authors from the commercial supply chain sector [22; 23]: 1) Gunasekaran and Ngai who outlined five key success factors to a small logistics enterprise, namely strategic planning, transportation planning, capacity planning, resource and information management [26]. 2) Power et al. who defined success factors to an agile supply chain, namely human resource management, information and technology management as well as utilization, inventory management, collaboration as well as continuous improvement and just in time concepts [19]. 3) Thus of Razzaque and Cheng who determine key success factors specific to outsourcing of logistics function to logistics service provider [25]. Summarized Lu et al. and Pettit and Beresford identified following: key success factors strategic planning (including corporate strategy, centralized or decentralized distribution centers, outsourcing of non-score activities, budget and deployment of resources), inventory management, transport and capacity planning, information management and technology utilization, human resource management, continuous improvement and collaboration and supply chain strategy [22;23]. Oloruntoba has investigated the key success factor for a relief chain based on document analysis and semi-structured face to face interviews with directors and mid-ranking managers of three significant civil response organization to evaluate the management of relief operations during the cyclone ‘Larry’ in Australia [11]. He has grouped the key success factors into two categories: 1) Preparedness and readiness in form of prior cyclone awareness and education, accurate and specific early warning as well as effective prioritization and planning. 2) Unity of direction and whole of government response [11]. Komrska et al. have identified

recommendations that can be seen as key success factors to improve the ready-to-use therapeutic food (RUTF) supply chain of UNICEF. The five delineated key success factors implementation of key performance indicators, pre-position buffer stock, diversification the RUTF supplier base, improve inter-agency and donor collaboration and improve information flow and forecasting [24]. From the above key success factors for humanitarian supply chains it becomes apparent that there are more specific key success factors which have to be outlined for the ultimate success of humanitarian supply chains and applicable to all HAA and other humanitarian actors with similar objectives and strategies.

#### IV. RESEARCH METHOD

##### Research settings

Hofer and Schendel stated that the identification of key success factors is obvious and easy due to a combination of sensitivity and elasticity analysis [35]. However, Leidecker and Bruno argue that key success factors are not as obvious. Although the sensitivity and elasticity analysis are useful identification tools but they are by no means sufficient, nor are they only useful methods for identifying key success factors [36]. Leidecker and Bruno for example have proposed environment scanning, industry structure analysis, opinions of experts in the industry, analyse of competitors, and analyse of the industry's dominant firm, a specific assessment of the company, intuitive judgments and the profit impacts of market strategies as further analysis instruments [36]. Summarized, key success factors are seen as areas, objectives and points for the overall organization on a strategic, tactical and operational level. Key success factors support the management to achieve the corporate and organization goals, quality, and high performance and contribute to competitive success in the business. So, the key success factor methodology that is proposed by Freund is as follows [10]:

- 1) Analysis of objectives and mission of the organization to determine success factors.
- 2) Identification of key success factors for each organization unit, and then key functional areas.
- 3) At each level the number of key success factors ranges between five and ten to avoid that performance indicators are going to be used.
- 4) Development of strategies to influence competitive strength and overcome weakness in each area and focus on the areas offering the maximum benefit.
- 5) Development of measurement tools to monitor performance.
- 6) Creation of processes and procedures to report performance information in time.

To identify the key success factors for the humanitarian supply chain based on the steps suggested by Freund, we used the case study method as a research method [10]. The case method is essential for the development of new theory parts and for a design of explorative research [37] and it is suitable for studying areas in complex contexts [38]. The case study method helps to study and understand the success factors of humanitarian supply chains because it is rarely established in science and practice. We applied case study approach to learn about the complex operating procedures and objectives of HAA. The case study approach allows to address "Why?" and "How?" questions [39]. The unit of analysis was HAA and following research questions are posed in this paper:

*RQ1.* How are the objectives of HAA?

*RQ2.* What are the key success factors for HAA in a humanitarian supply chain?

*RQ3.* Why decisions or actions are keys to these success factors?

##### Data collection

Two German and two Dutch HAA as well as one US organization were selected due to their different humanitarian supply chain and different organization structure. This range of HAA allows a widespread data collection on the objectives and key success factors in the humanitarian supply chain field. Furthermore it ensures the validity. Following HAA were selected:

- *Organization 1* is a neutral NGO and contributes to humanitarian aid worldwide. It has a federative structure and consists of a national entity and 19 general branches with a membership of over 420 district branches as well as a national federation of nurses associations with 34 nurses associations. It works in 50

countries worldwide in the response phase as well as in recovery and reconstruction phases. The relief items in disaster relief, disaster preparedness, and disaster risk reduction are shelter, water, sanitation, basic healthcare and healthcare education.

- *Organization 2* is a NGO and seeks to fight against hunger and poverty as well as for sustainable food security in the response phase as well as in recovery and reconstruction phases. In 2011, Organization 2 worked in 39 countries worldwide and focused on regional development, social integration and education, as well as basic infrastructure.
- *Organization 3* is a NGO and provides health services to more than 200,000 truck drivers of the road freight industry, sex workers and community members in Africa. It operates 24 roadside wellness centers.
- *Organization 4* is an international, neutral, an independent non-profit, self-governed organization with 23 associations worldwide. It supplies aid e.g. medical care, water, sanitation to people that were affected by natural disasters, armed conflicts as well as epidemics.

Case data were collected by using semi-structured interviews with the head of the operations management and logistics unit as well as logistics manager. The interviews (telephone and e-mail) were the main source of our data and the six questions concentrated on the objectives of the humanitarian supply chain, key success factors and the measurement of key success factors. The interviews had duration from 1 h to 1.75 h and took place in the time period between January 2013 and February 2013. Unclear answers were clarified through follow-up questions in further phone talks and with one respondent through email. The sample size of five is within the proposed standard of between four and ten cases [40]. This study includes five interviews in total and all respondent demanded that their HAA names should not be mentioned. Further the interviews were conducted with questions about the general issues about the organization, structure, logistics volume and operations in the field. All of the interviews were recorded on audiotape and transcribed afterwards; exceptional one respondent has answered by email because of time restrictions and his work in a project in Asia. Furthermore the annual reports as well as the webpages of the HAA were studied to verify the transcribed data. Data were analysed using qualitative content analysis [41] supported to ensure the validity. The analysis consisted of two following stages:

- 1) Grouping the data into themes and trends
- 2) Analysing similarities and differences regarding key success factors across the five interviews

## V. FINDINGS

In this section the results of the deployed exploratory research design is presented. Organizations 1 to 4 were asked to define the humanitarian supply chain in case of natural disasters. There are no grave distinguishing features between the definitions. Summarized, a humanitarian supply chain is seen by the four organizations as follows:

‘As the complete process of humanitarian logistics and include planning, procurement, distribution, transport, warehouse management, fleet management, monitoring and evaluation the material information and financial flow in a timely manner in consideration of different type of goods, different type of disasters and different type of phases in the case of disaster.’

In this case study, four HAA – different in size, goods, number of staff, number of projects, received donations and corporate identity – consistently consider the main role of the supply chain to ensure the right items, in the right place, at the right time, at the right cost, in the right condition, and in the right quantities. All four organizations act neutral in the field, are non-profit organizations and provide beneficiaries with aid. Furthermore the topic efficient supply chain or logistics increased significantly and they focus on improving and promoting the supply chain and invest the savings in achieving more people that are affected by natural or man-made disasters and becoming much more transparent for the stakeholder. The results related to the key success factors are presented in the following table for a better structure and use in the analysis and discussion section.

Table 1: Results of the interviews with four HAA

Themes and trends	Organization 1	Organization 2	Organization 3	Organization 4
Central Objectives for humanitarian supply chains	Time, quality, security, costs and neutrality on strategic, tactical and operational level	Availability of goods in the right time in the right place, price, quality, proper information for proper planning of activities	Avoid of out of stock, availability of goods in the right time in the right place, preventing expiry of medication, security, continuum of care, cost control, donor satisfaction, provide sufficient medicine for patient	Multiple chain (because depending on case and need) therefore different type of goods in different chains, for humanitarian medical activities staff is needed, price, quality, considering rules, ethical principles, impartiality and independence from the different actors within the conflict
Essential success factors to achieve these objectives	<ul style="list-style-type: none"> <li>▪ Sustainability</li> <li>▪ Speed and flexibility</li> <li>▪ Cooperation, coordination and network</li> <li>▪ Local procurement</li> <li>▪ Performance measurement</li> <li>▪ Beneficiary involvement</li> <li>▪ Standardization (e.g. relief items, processes)</li> </ul>	<ul style="list-style-type: none"> <li>▪ Proper assessment and planning in advance</li> <li>▪ Qualified staff, enough staff members</li> <li>▪ Monitoring all the time in order to re-adjust if necessary</li> </ul>	<ul style="list-style-type: none"> <li>▪ Availability of goods</li> <li>▪ Growth of the wellness centers to reach many people</li> <li>▪ Inventory management</li> <li>▪ Order management</li> <li>▪ Performance measurement</li> <li>▪ Security</li> <li>▪ Medical quality control</li> <li>▪ Contract management with donors</li> </ul>	<ul style="list-style-type: none"> <li>▪ Availability of goods over the price</li> <li>▪ Speed</li> <li>▪ Saving lives</li> <li>▪ Cost efficiency in case where planning is possible</li> <li>▪ Independence</li> <li>▪ Impartiality</li> <li>▪ Knowledgeable and motivated staff</li> </ul>
Decisions or actions that are keys to these success factors	Save lives, come back to the normal life (beneficiaries), transparency, communication to donor, internal organization (agility), lean administrative internal structure	Qualified and experienced staff	Quality system in place (TQM), monitoring and evaluation	Medical ethics, independence, impartiality, neutrality and accountability
Measurement of success for supply chains	<p>Quantitative measures are available (e.g. mortality rate, number of delivered shelter and water, number of provided beneficiaries with relief items, lead times, provided beneficiaries with health in case of an installed hospital, lead times and measurement of impact)</p> <p>Qualitative measures are not developed yet because of the complexity</p>	<p>A regular 'controlling' such as in a commercial company is hardly possible in a Humanitarian Aid Agency;</p> <p>it is very difficult to measure the success of the supply chain. It can be rated case by case only</p>	Quantitative measures for the process, training, number of visits/clients, medical care (e.g. TB, HIV, malaria etc.), diagnosis, treatment, cost per service, stock level	Not easy to measure the success of the supply chain; Measurement of availability of good, mortality rate or service level is possible

**Analysis and discussion**

Although the four HAA are different in size, goods and corporate identity the central objectives of their humanitarian supply chain are similar. Three main objectives have to be considered in the humanitarian supply

chain such as neutrality, availability of goods and information. They target to stay neutral in case of natural or man-made disasters and work irrespective of race, religion, gender or political views. Furthermore they do not intervene to the political, economic or religious interests of a government. Another priority is to follow the ethical aspects which mean they treat the beneficiaries with dignity and they respect their religion and culture. The objective neutrality as an ethical aspect seems to be important even for creating a supply chain because it has a great effect on the access to the affected country or to increase the security standard of the staff and goods as well as to have success in the operational level e.g. on procurement to avoid crimes and corruption. Further the HAA prioritize the objective availability of goods that should be in the right time, in the right place, to the right price and in the right quality. Quality of goods in a humanitarian supply chain is an essential criterion that stands for e.g. preventing the expiry date of products or standardization of the relief items. Further one organization mentions that they have 150 different kits for different situations that are stored in their warehouses worldwide to avoid out of stock situations and depending on the humanitarian supply chain management phases to ensure the speed and to reach the victims in the right time.

The third objective for the HAA is information. The information is needed for a proper planning. The HAA have different concepts to get the needed information in case of a disaster to reduce vulnerability and to save lives. The term information has to be subdivided in two categories, 1) information about the situation e.g. mortality rate, impact on health, affected people, access to areas and logistics hubs e.g. airports, seaports, development of the disaster, population structure, availability of sources in the affected area, staff and their education; 2) information about the security, reporting to local authorities and communication to the national security services, other HAA, supplier or logistics service provider. Based on the collected data the key success factors for humanitarian supply chain can be classified in strategic, tactical and operational level that are summarized in table 2. In the first look the identified key success factors seem to be similar to the commercial key success factors of an enterprise. Hereby a HAA does not target profit maximizing or expansion to fulfill the needs of the customer or to assess the threats and opportunities as well as strengths and weaknesses of its business environment. The present study seeks to distinguish these factors according to the strategic, tactical and operational level based on Freund as well as Oakland [10; 14].

Table 2: Identified key success factors for humanitarian supply chains

Strategic	Tactical	Operational
<ul style="list-style-type: none"> <li>▪ Sustainability</li> <li>▪ Cooperation</li> <li>▪ Performance measurement</li> <li>▪ Standardization of relief items, processes</li> <li>▪ Growth</li> <li>▪ Security</li> <li>▪ Independence and impartiality</li> <li>▪ Continuum of care</li> </ul>	<ul style="list-style-type: none"> <li>▪ Coordination</li> <li>▪ Beneficiary involvement</li> <li>▪ Proper assessment and planning</li> <li>▪ Qualified and experienced staff</li> <li>▪ Inventory management</li> <li>▪ Long-term contracts</li> <li>▪ Quality management</li> </ul>	<ul style="list-style-type: none"> <li>▪ Speed</li> <li>▪ Flexibility</li> <li>▪ Local procurement</li> <li>▪ Order management</li> <li>▪ Cost efficiency</li> <li>▪ Enough staff members in the field</li> <li>▪ Availability of relief items</li> </ul>

Two key aspects have to be considered that HAA target to save many lives much more as possible despite the chaotic environment and to use efficiently donations. Summarized the factor saving lives or beneficiaries can be seen as a main output criteria and the factor donations can be seen as main input criteria in a humanitarian supply chain. Compared to the counterpart the classical commercial supply chain considers main input criteria such as a product and the main output criteria the satisfaction of the customer. The above mentioned key success factors for humanitarian supply chain are derived from different decisions and actions from the HAA. For example the key success factor sustainability is essential for HAA because their aim is to save lives and to bring the beneficiaries in normal life situations and the victims should grow on their own means. Further the HAA should be transparent for their stakeholder e.g. donor and be lean and agile in their overall internal organization structure or following the Humanitarian Aid Agency principles such as accountability, different ethics aspects and independency e.g. to achieve the growth. The case study has shown

that the humanitarian claims about the difficulties to measure the success that is categorized in qualitative and quantitative criteria. Further the adaption of the commercial performance system and its establishment in the humanitarian supply chain management has to be criticized due to different reasons. The quantitative measurement e.g. of lead times or the number of supplied beneficiaries with relief items is possible nowadays. The great challenge is supposed in qualitative measurement e.g. staff satisfaction compared to last year (last project) or to mitigate inflation (the purchase prices not increase more than a certain percentage compared to last year) or do the carrier keep performing according to what is expected or beneficiary satisfaction compared to the last period.

## VI. CONCLUSION

This paper highlights that the identified key success factors are relevant in humanitarian supply chains but with different targets. However, there are potential implications from these research findings for different HAA. These are important for an effective management of emergency response measures. As limitation it can be observed that the boundaries between the objectives of the stakeholders, key success factors and performance measurement metrics are not sufficiently clear. Therefore as a further development the boundaries have to be defined. By a sufficient definition of objectives and key success factors a holistic performance measurement metrics can be developed that matches the humanitarian supply chain environment - considering the link between logistics processes and donations. The suggested key success factors here have to be translated into measurement metrics and implemented as well as tested in different HAA. Further a performance measurement system and tools can be developed for this sector based on these research results

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