Transdisciplinary Engineering: Crossing Boundaries
M. Borsato et al. (Eds.)

doi:10.3233/978-1-61499-703-0-1113

Performance Measures to Humanitarian Logistics: The Perspective of the Humanitarian Assistance Chain

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Abstract. Earthquakes, hurricanes, floods, tsunamis and other emergency situations have demanded a special logistic treatment named Humanitarian Logistics, has currently been studied in several countries around the world. The goal of this article is to compare the performance measurement in the humanitarian supply chain to the traditional performance measurement in the commercial supply chain, to develop performance indicators in the humanitarian supply chain and present a structure that can be used as a basis for the development of a performance measurement system for the humanitarian logistics.

Keywords. logistics, humanitarian logistics, performance measures, humanitarian assistance chain.

Introduction

Some events such as the tsunami and earthquake in Asia, the hurricane Katrina, the earthquakes in China in, the earthquake and tsunami in Japan– among others – are demonstrating the vulnerability of modern societies, making evident a special logistics handling, which is being named humanitarian logistics. Many researches are being developed showing the relevance of humanitarian logistics for nations 0[2][3][4][5][6][7][8][9][10].

Many organizations of humanitarian assistance are handling many donations and a high volume of resources (the largest organizations handle billions of US dollars yearly). Currently, donors, agencies and volunteers can ask themselves: are humanitarian assistance organizations indeed practicing what they preach? Are their programs and projects efficient? The lack of resources, the increase in the frequency and dimension of disasters are requiring more transparent, efficient and effective operations. In this regard, the development of performance measures is becoming fundamental for all organizations involved in managing the humanitarian assistance chain.

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The article starts approaching concepts linked to humanitarian logistics. Following that, it compares the commercial supply chain to the humanitarian assistance chain. Next, humanitarian and corporate logistics regarding the characteristics linked to measures of performance are compared. Finally, the development of a system of performance measures to the humanitarian logistics is presented.

1. Defining Humanitarian Logistics

The definition of humanitarian logistics comes from the logistics objectives related to the commercial supply chain, i.e., beat time and distance in moving materials and services in an efficient and effective way.

Humanitarian logistics is the function that aims at the flow of people and materials in a proper and timely manner in the assistance chain, with the top objective of correctly serving the largest number of persons [1].

Humanitarian logistics are processes and systems involved in mobilizing people, resources and knowledge, in order to help vulnerable communities affected by natural disasters or complex emergencies. It seeks a fast response, aiming at serving the largest number of persons, preventing shortfalls and waste, organizing the many donations received in such cases, and above all act within a limited budget (International Federation of Red Cross, [11]).

The humanitarian logistics are the function demanded to ensure with efficiency and effectiveness the flow of supplies and persons, aiming at saving lives and ease the suffering of vulnerable persons (adapted from Thomas, [2]).

The concepts presented highlight that it is not enough being efficient, it is also necessary to be effective, i.e., under the eye of humanitarian logistics, help must reach its destination in proper and timely fashion, always focusing in easing suffering and preserving life.

In a general way, humanitarian logistics proposes the effective use of logistics concepts, adapted to the specifics of humanitarian assistance chains. These concepts may be the key differential to maximize the efficiency and response time to the emergency situation.

2. Commercial Supply Chain and Humanitarian Assistance Chain

The main objective in the commercial supply chain is to deliver the right products in the precise quantity to the correct location within proper timing. As such, the process involved encompasses all activities related to the flow and transformation of goods and information, from the start to the end point. In Figure 1, it is possible to see a commercial supply chain with four levels: supplies, production, distribution and consumers.

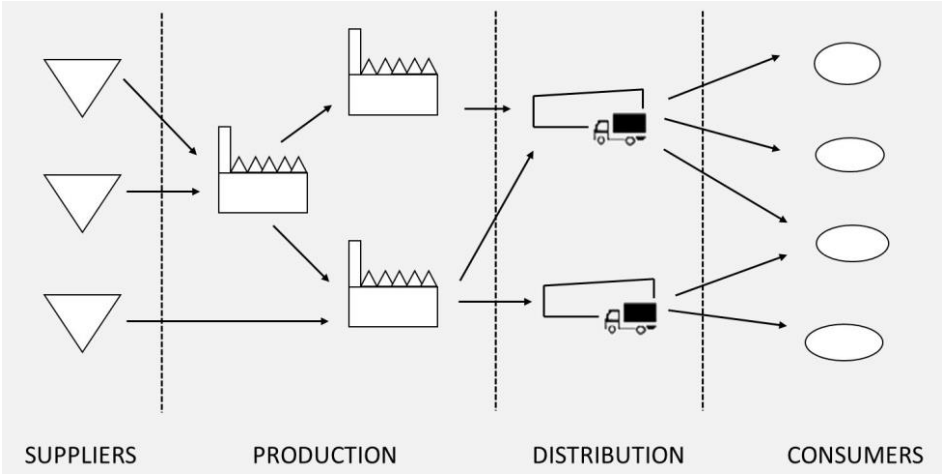

Figure 1: Structure of a commercial supply chain (adapted from Beamon, [12]).

Similar to a commercial supply chain, in the humanitarian assistance chain the flow of supplies, obtained from donors and/or suppliers, initially flows from pre-existent inventories. In general, supplies are transported from several locations in the world to a distribution center located in a strategic point. After that, supplies are carried to a second distribution center (typically located in a larger city). In such second distribution center, supplies are segregated, classified and transferred over to local distribution centers. At the end, supplies of humanitarian assistance are delivered to beneficiaries. The supplies purchased from local sources must also be sent to local distribution centers, or directly distributed to the beneficiaries (Beamon, [3]).

Since a disaster occurs, a humanitarian assistance organization generally uses a standard process. The basic structure of an assistance mission have 4 distinct phases (Thomas, [13]):

1. Assessment: Identification of needs based on the specific characteristics of the occurrence. In this phase few resources are needed.
2. Organization: Growing need of resources, according to the characteristics identified in phase 1.
3. Sustaining: Period during which operations are sustained and resources are kept.
4. Reconfiguration: Operations are reduced until finally they completely end.

3. Performance Measures

There is plenty of literature about performance measures and their application. However, most of existing researches focuses on corporate logistics and the services sector. Neely and Adams define a performance measure as being the process to quantify the efficiency and effectiveness of an action [14]. The same authors highlight that a performance measures system shall answer to questions such as: Are the measures aligned to the organization's goals? What is the focus of the measures (financial, clients, employees, suppliers)?.

According to Rouse & Putterill, there are many approaches or methods for performance measures, each with its own purpose [15]. These different approaches have their effective contribution, but in essence they are incomplete. Among these approaches, the models of business excellence, shareholder value frameworks, ABC, benchmarking and balanced scorecards are the ones that stand out.

The great challenge to establish performance measures, both in corporate and in humanitarian logistics, is in the degree of complexity of the chain, and in the traditional difficulties regarding what to measure and how to measure. Because of different characteristics for corporate and humanitarian assistance organizations, performance measures for the latter will also be different.

There are additional challenges to humanitarian assistance organizations, when they start to measure their logistics performance. Some authors suggest challenges such as: the intangible character of services provided; the magnitude and variety of missions; the different levels of interest. Sawhill & Williamson provide the following example [16]: "Imagine an organization whose mission is to ease human suffering. How can you measure such abstract notion? How can an organization obtain, in a relevant way, its direct contribution in such a broad mission? What criteria shall be taken into account to assess how successful a mission is?".

3.1. Performance Measures and Corporate Logistics

In a traditional corporate system, two performance measures are predominantly being used: cost and customer satisfaction. However, many types of costs are not quantifiable, and other types of measures are not easily converted into costs.

Within a corporate context, performance measures may be split into three types, according to Lindenberg & Bryant [17]:

1. Internal Measures: These measures include inventory levels, use of equipments, energy consumption, production costs, customization of orders, etc;
2. Flexibility Measures: In the midst of uncertainties, quick response to change and the development of a certain degree of flexibility is paramount. In this regard, the flexibility measures were created, with highlights for the following:
    - Volume flexibility: Allows changing the products' output level [18];
    - Shipping flexibility: Allows changing the schedule of shipping dates;
    - Mix flexibility: Allows changing the variety of products [19];
    - New products flexibility: Allows producing and launching new products in the market;
3. External Measures: These include sales, delivery time, response time to consumers, quality and quantity of finished goods.

3.2. Performance Measures and Humanitarian Logistics

Performance measures are not usually handled within the humanitarian assistance sector. However, organizations from the sector are beginning to pay attention to their importance and urgency, mainly due to the increased competition in fund raising and donations, and to improve visibility and to keep society posted on their affairs.

Poister highlights the relevance of developing performance measures in humanitarian logistics [20]. The author argues that such development of performance measures systems may help the managers of humanitarian assistance organizations in decision making and in improving logistics performance. Apart from that, when these systems are effectively planned and implemented, performance measures provide a return that encourages managers, employees, volunteers and donors to improve performance even further. Such systems may also help in assessing resources with more efficiency and effectiveness, catering for better controls in operations.

The characteristics inherent and exclusive to the humanitarian assistance environment bring great challenges related to the proper selection of performance indicators, and the development of appropriate measuring systems. As observed by Kaplan [21], and by Henderson et al. [22], the not-for-profit sectors, generally, will describe measures of performance through the number of donations and operating expenses. In spite of the fact that a humanitarian assistance organization's success depends, partly, of fund-raising, its performance is not linked to this aspect. Increasing gains or donations does not necessarily increase the quality of services provided and the organization.

Efficient and effective processes are fundamental for the humanitarian assistance organizations. Many of those who act in events of emergency nature assure that the use of concepts in these situations may immensely contribute to the success of an operation. In this regard, performance measures are important in assessing the execution of an operation and in providing society with information.

Contrary to the corporate context, in humanitarian logistics the life of people is always the top objective to be attained. It is known that conditions are specific and different from those faced by corporations. As such, in the sequence we will present the development of a performance measures system to humanitarian logistics, which aims at being the key contribution of this article.

4. The Development of a Performance Measures System to Humanitaria Logistics

In order to establish performance measures to humanitarian logistics, it is important to analyze it from an operational point of view, i.e., considering those receiving support as clients. This conceptual model recognizes the relevance of donors, but allows the process to focus efficiently and effectively in the humanitarian view.

Differently from corporate logistics, donors do not have means to check how humanitarian assistance organizations are employing their resources and serving their expectations. On the other hand, if humanitarian assistance organizations have instruments to measure their performance, and provide society with information, stability and an increment in donation levels may be attained.

The basic questions regarding the development of a performance measures system to humanitarian logistics are the same of those for a corporate system: What is the best measure? What are the most appropriate indicators? What are the relations between performance indicators and decision making variables? How individual indicators can be integrated in a performance measures system?

1. Internal Performance Measures: Allows humanitarian assistance organizations to estimate with higher accuracy the needs of resources for several missions and/or activities. Usually, the cost is the key indicator in traditional corporate logistics, in

humanitarian logistics there are three main costs: procurement; distribution; and inventory carrying.

Procurement Cost: Unforeseeable demand patterns increase the complexity in relationships between suppliers and humanitarian assistance organizations. The uncertainties in demand also make it difficult to assess procurement, as generally it cannot be made prior to the disaster's occurrence. In this regard, it is difficult to have a control on the cost of supplies. As such, the internal performance measure of procurement cost must assess the effects of costs of procurement strategies (as per-disaster inventory control) against a post-disaster acquisition.

Distribution Cost: Frequently, humanitarian assistance organizations need to transport several materials, in large quantities, within a very short period of time. The unforeseeable nature of demand, in humanitarian logistics, difficult the development of reliable relationships and partnerships with transport companies. The diversity of locations in which disasters occurs bring a need for a variety of transportation means (trucks, trains, airplanes, helicopters, etc). Also, the use of local distribution companies may be needed to hit the “last mile”. So, an internal performance measure in distribution shall assess the potential areas and specific transport means for each disaster type, aiming at reducing distribution costs.

Inventory Carrying Cost: Differently from procurement and distribution costs, not all humanitarian assistance organizations will have inventory carrying costs. This happens as only some humanitarian assistance organizations keep and operate their own centers of supplies and inventories. The control of inventories in humanitarian logistics is still a great challenge. The internal performance measure of inventories carrying costs shall assess the different types of costs related to stocks maintenance. For instance, if the humanitarian assistance organization stores many perishable items, then the costs related to losses shall be measured.

The internal performance measures may also include the development of IT systems, use of coordinated processes of people, materials and information, simulation systems, training in emergencies.

2. Flexibility Measures: In corporate logistics, a flexibility performance measure may assess the ability of a system to support variations in volume and time schedule of suppliers, manufacturers and clients. In humanitarian logistics, flexibility performance measures are special for two reasons: the focus (save lives and ease suffering) and the uncertainty of demand (location, type and magnitude). The inherent degree of uncertainty in an emergency requires high levels of flexibility. As such, we can define flexibility measures such as:

Flexibility of Volume: Flexibility to respond to different magnitudes of disasters. The performance measure of flexibility of volume may assess the number of first need items that a humanitarian assistance organization is capable of dispatching during the first stages of the mission. In short, it is linked to the different magnitudes of disasters.

Flexibility of Shipping: This is linked to the response time to the disaster and the flexibility of shipping to different locations, what may signify the success or the failure of an operation. The performance measure of flexibility of shipping may assess the time lapsed from the start of the disaster and the arrival of the supplies from the organization to the site.

Flexibility of Mix: This is linked to the different types of disasters and to the specificities of each case. The performance measure of flexibility of mix will assess the different types of items that are demanded and transported to the affected area. A

flexibility measure for mix may assess the number of different items and the quantity of each of these that the humanitarian assistance organization can supply during a specific time frame.

3. External Performance Measures: They are directly linked to easing the suffering of people involved and to the number of lives to be preserved. In this regard, the following external performance measures can be defined:

Response time: In humanitarian logistics, response time is critical and many factors may contribute to it, such as, the proper estimation of the humanitarian assistance organization, procurement and delivery strategies, definition of transport, suppliers, etc. There are certain items that are especially needed during the first stages of any emergency (medicines, tents, personal hygiene items, basic foodstuff, clothing).

Supply of products: For corporate logistics there are many variants of this basic indicator, such as the number of units produced for each time interval, of each type of product, sold in each region, etc. In humanitarian logistics, an external performance measure of supply of products shall assess the quantity supplied of each item, in each region. A question that shall also be addressed is the impartiality, i.e., distribution of supplies in just and equal terms.

As in the corporate environment, humanitarian assistance organizations have their own specificities. The proposed performance measures system encompasses the general principles that shall be observed in defining the specific performance measures for each organization.

5. Final Considerations

This article aimed at comparing performance measures in the humanitarian assistance chain against traditional performance measures in commercial supply chain, highlight the characteristics of corporate and humanitarian logistics, and introduce a performance measures system to humanitarian logistics, which may be used by humanitarian assistance organizations and serve as basis for further developments.

The conceptual approach aimed at introducing a different view from the traditional one, the one of humanitarian logistics, launching the basis for the development of a systemic research of performance measures linked to humanitarian logistics.

It is important to highlight that the proposed performance measures system aimed at bringing the general principles, but that it mus be confronted against the specificities of each organization of humanitarian assistance and each type of emergency situation so that new indicators may be reflected.

Currently, the international community is recognizing that the magnitude, the number of affected persons and the recurrence of disasters produced by natural or other phenomena are increasing. In this regard, great challenges are presented to humanitarian logistics, highlighting: aspects related to infrastructure, location of assistance centers, coordination of processes (persons, supplies, information, materials), and, mainly, the development of performance measures that will assess all of these activities.

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