



An Investigation for Performance Measurement in Humanitarian Relief Logistics Management

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Abstract

Humanitarian relief logistics management activities aim to help sufferers and injured people on disaster areas. All humanitarian relief actors must improve their performances to achieve these aims in a more effective and efficient way. In this paper, performance measurement in humanitarian relief logistics management is investigated to enable the usage of it by all humanitarian relief actors. Hence, a detailed literature review is presented, for performance measurement in humanitarian relief logistics management.

Keywords: Humanitarian Relief, Performance Measurement

Introduction

Relief-oriented nongovernmental organizations are nonprofit organizations and differ from for-profit organizations in the commercial sector. The general aspects of nonprofit and for-profit organizations are important in characterizing their supply chains [1]. Beamon and Balcik [1] apply three different performance measurement metrics consisting of resource metrics, output metrics, and flexibility metrics for developing humanitarian relief chains metrics which is developed by Beamon [2] for commercial supply chains. Davidson [3] proposes four performance indicator frameworks as for appeal coverage, donation-to delivery time, financial efficiency, and assessment accuracy for humanitarian logistics using interview results with professionals at the International Federation of Red Cross and Red Crescent Societies (IFRC). Petit and Beresford [4] proposed critical success factors for humanitarian aid supply chain by taking into consideration commercial supply chains' critical success factors. They investigate five different critical as strategic planning, inventory management, transportation planning, capacity planning, and information management that are identified by Gunasekaran and Ngai [5] for a small logistics company. Zhou et al [6] proposed a fuzzy decision-making trial and evaluation laboratory approach for identifying critical success factors for emergency management. They proposed twenty different criteria for evaluating based on expert decision. According to the fuzzy approach results, continuous improvement of the operational system of emergency management is determined as the most important critical success factor for the operation of emergency management system. Schulz and Heigh [7] design a development indicator tool for performance measurement for humanitarian logistics. Their indicators are designed according to the four perspectives as customer service, financial control, process adherence, and innovation and learning. This indicators are using as an instrument to measure the current performance of identify development need and measure the impact of the action taken upon it by IFRC. Piecyk [8] proposed a performance measurement framework that takes into consideration the key stakeholders of the logistics departments or personnel in humanitarian organizations. Celik et al. [9] proposed analytical hierarchy process approach based on interval type-2 fuzzy sets for determining the critical success factors for humanitarian relief logistics management. Oloruntoba [10] described two key success factors in the operational effectiveness of the Cyclone Larry ERC and the overall management of Cyclone Larry. Table 1 presents five papers which proposed performance measurement or critical success factor for humanitarian relief logistics. They all developed different aspects and highlights the importance of performance measurement for humanitarian relief management. It is important to develop a framework of performance measurement for humanitarian relief logistics management to evaluate changes and to assess the performance of the humanitarian relief logistics. Hence, in this paper, we investigate five main performance measurement based on literature review for humanitarian relief logistics management as management and planning, human resources and volunteer management, transportation and distribution, warehouse management and information systems.

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Table 1. Performance measurement based on literature review

Reference	Performance measurement
Davidson [3]	Appeal coverage
	Donation-to delivery time
	Financial efficiency
	Assessment accuracy
Beamon and Balcik [1]	Resource performance metrics
	Output performance metrics
	Flexibility metrics
Petit and Beresford [4]	Strategic Planning
	Inventory management
	Transport and capacity planning
	Information management and technology utilization
	Human resource management
	Continuous improvement and collaboration
Oloruntoba [10]	Supply chain strategy
	Routine cyclone awareness and education campaigns
	Specific early warning about Cyclone Larry
	Prior standing pre-cyclone plans and strategic planning
	Government unity of direction and whole of government response
Zhou et al. [6]	The Australian Defense Force and tactical ERC planning and execution
	Reasonable organizational structure and clear awareness of responsibilities
	Information system to ensure information transferring
	Government unity of leadership to plan and coordinate as a whole
	Application of modern logistics technology
	Continuous improvement of the operational system of emergency management

The rest of this paper is organized as follows. Section 2 presents the explanation and literature for each performance measurement. Conclusions are given in last section.

The Performance Measurement for Humanitarian Relief Logistics Management

Effective performance measurement for humanitarian relief logistics management would support practitioners and managers in their decision making process, help improve the effectiveness and efficiency of relief operations, and demonstrate the performance of the relief chain, thereby increasing the transparency and accountability of disaster response [1]. In this paper, five different main performance measurement and twenty three sub performance measurement are obtained based on literature review. Management and planning directly affects the relief activities. Five sub-criteria are determined under this criterion as: Effective inventory management, effective supplier relationships, well-planned supply system, strategic and operational planning, and effective human resource management system (Table 2).

Table 2. Performance measurement for management and planning

	Performance measurement	References
Management and Planning	Strategic and operational planning	Fritz Institute [11], Lu et al. [12], Pettit and Beresford [4], Moe and Pathranarakul [13]
	Effective human resource management system	Pettit and Beresford [4], Apte [14], Tomasini and Wassenhove [15], Moe and Pathranarakul [13]
	Effective inventory management	Beamon and Kotleba [16], Whybark [17], Petit and Bresford [4], Balcik et al. [18]
	Well-planned supply system	Davidson [3], Pettit and Beresford [4], Zhou et al. [6], Oloruntoba [10], Seneviratne et al. [19], Moe and Pathranarakul [19]
	Effective suppliers relationships	Beamon and Balcik [1]

Humanitarian relief efforts generally operate on limited funds or budgets which increase the importance



of effective inventory management (Beamon and Balcik). Effective supplier relationship is crucial for governmental and non-governmental relief organizations for satisfying demand once a disaster occurs. They can also make framework agreement for minimizing the raise of prices on disaster time. Organization is composed of five sub-criteria: Organizational structure, certain job descriptions, employee training, continuous improvement and corporation, and performance evaluation system (Table 3).

Table 3. Performance measurement for organization

	Performance measurement	References
Organization	Organizational structure	Oloruntoba [20], Davidson [3], Zhou et al. [6]
	Employee training	Oloruntoba [10], Zhou et al. [6], Apte [14], Kovács et al. [21], Kovács and Spens [22]
	Continuous improvement And corporation	Kovács and Spens [23], Pettit and Beresford [4], Zhou et al. [6]
	Performance evaluation system	Pettit and Beresford [4], Beamon and Balcik [1], Sandwell [24]
	Certain job descriptions	Oloruntoba [20], Davidson [3], Zhou et al. [6], Sandwell [24], Moe and Pathranarakul [13]

Transportation and distribution is also crucial and an important aspect in humanitarian relief logistics management which is a requirement to address suitability of distribution vehicles, distribution speed, suitability of distribution personnel, suitability of distribution network, and safety of personnel and inventory in such circumstances (Table 4).

Table 4. Performance measurement for transportation and distribution

	Performance measurement	References
Transportation and Distribution	Safety of personnel and inventory	Beamon and Balcik [1], Zhou et al. [6]
	Distribution speed	Beamon and Balcik [1], Petit and Bresford [4], Zhou et al. [6], Apte [14], Moe et al. [13]
	Suitability and availability of distribution personnel	Pettit and Beresford [4]
	Suitability of availability distribution vehicles	Petit and Bresford [4], Wassenhove and Martinez [25], Kovács and Spens [22]
	Suitability of distribution network	Pettit and Beresford [4,26]), Sandwell [24], Seneviratne et al. [19]

Warehouse management is a long term and generally one of the most important strategic decisions in humanitarian relief logistics management. Suitability warehouse location, warehouse personnel, warehouse tools are determined as performance measurement of warehouse management (Table 5).

Table 5. Performance measurement for warehouse management

	Performance measurement	References
Warehouse management	Suitability of location	Lu et al. [12], Balcik and Beamon [27], Apte [14], Kovács and Spens [22], Döyen et al. [28], Duran et al. [29], Gunnec and Salama [30]
	Suitability of personnel	Zhou et al. [6], Kovács et al. [21]
	Suitability of tools and vehicles	Lu et al. [12], Pettit and Beresford [4], Kovács and Spens [22]

Effective information systems can minimize the major reasons behind the unsatisfactory performance levels of humanitarian relief logistics management practices. Hence, information systems are one of the CSFs that highly affect humanitarian relief logistics management. This main criterion contains early warning systems, short answer and feedback time, effective information analysis, quick and effective



reporting, and effective communication and emergency information systems.

Table 6. Performance measurement for information systems

	Performance measurement	References
Information Systems	Early Warning Systems	Ju et al. [31], Oloruntoba [10], Seneviratne et al. [19]
	Short Answer and Feedback Time	Zhou et al. [6], Oloruntoba [10]
	Effective Communication and Emergency Information Systems	Zhou et al. [6], Ju et al. [31], Apte [14], Moe and Pathranarakul [13], Moe et al. [32], Kovács and Spens [22]
	Quick and Effective Reporting	Pettit and Beresford [26], Zhou et al. [6], Moe and Pathranarakul [13]
	Effective Information Analysis	Zhou et al. [6], Apte [14], Moe and Pathranarakul [13]

Conclusion

Humanitarian relief logistics management activities directly focus on helping the sufferers and injured people on disaster areas. In other words, its first aim is saving the life of people and decreasing the death rate during a disaster. Performance measurement for humanitarian relief logistics management is critical for improving the relief activities. In this paper, twenty three different performance measurements are presented based on literature review. For future studies, the performance measurement for humanitarian relief logistics management can be also investigated in detail based on literature review and the experts' decision from nongovernmental and governmental humanitarian relief logistic organization. The proposed performance measurement can be also analyzed using decision-making trial and evaluation laboratory approach or its extension based on interval type-2 fuzzy sets for obtaining which is critical for humanitarian relief logistics management.

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