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Verfasser: Prof. Dr. Dorit Bölsche

Performance measurement in humanitarian logistics

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Herausgeber/Editor: Prof. Dr. Dorit Bölsche
Hochschule Fulda/Fulda University of Applied Sciences
Fachbereich Wirtschaft/Faculty of Business
Marquardstraße 35
36039 Fulda
Deutschland/Germany
www.hs-fulda.de/wirtschaft

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Abstract

The purpose of this paper is to provide the (humanitarian) logistics community with ideas how performance measurement can be applied in humanitarian logistics. Does performance measurement contribute to improve the performance in humanitarian aid? Approaches from the private sector such as performance indicators, scorecards and process-oriented models are presented and their application to the humanitarian sector with its different actors, aims and goals is analyzed. As one central finding of the paper can be pointed out that performance measurement is more than the collection of data and indicators – approaches that are able to combine the process-oriented perspective of logistics and supply chain management with performance measurement are appropriate to humanitarian logistics. Performance measurement gives the foundation for preparedness and continuous improvement and with this – in case of disasters – it can alleviate the suffering of vulnerable people

Keywords: humanitarian logistics, performance measurement, humanitarian aid, SCOR, Humanitarian performance

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List of Abbreviations

ALNAP..... Active Learning Network for Accountability and Performance in Humanitarian Action

CRED ..... Centre for Research on the Epidemiology of Disasters

IDP..... Internally Displaced Persons

KPI..... Key Performance Indicator

LPI ..... Logistics Performance Indicator

NGO ..... Non Governmental Organisation

SCC..... Supply Chain Council

SCOR..... Supply Chain Operations Reference

WFP..... World Food Program

1 Introduction

Starting point for this paper is an analysis from the year 2005 concerning humanitarian logistics. The Fritz Institute had worked out the state of the art and the gaps in this field.[1] The institute determined a "lack of recognition of the importance of logistics" and on this basis some other lacks concerning humanitarian logistics. Metrics and performance measurement had been identified as one step (beside four others) to close the lacks. The following citation illustrates the identified problem and a possible solution:

"In general, humanitarian relief organizations have focused on getting the job done and have put little effort into performance measurement other than reporting to donors on the amount of relief and usage of funds for a given relief operation." … "The Plan-Do-Check-Act improvement process that is commonly used in the private sector could be quite useful when applied to humanitarian logistics."[2]

In the year 2006 the Fritz Institute published a first paper focusing with key performance indicators solely on performance measurement.[3] Since the years 2005 and 2006 more activities and researches have dealt with performance measurement in humanitarian logistics, especially those which deal with processes, reference models or (logistic) performance indicators (e. g. by the World Bank).[4] In the year 2012 performance measurement is still an innovative topic for logisticians in the humanitarian sector. One initial question of this paper is, if the pain points, as they were identify in the paper from the Fritz Institute, still exist and if so, how they can be closed by performance measurement in humanitarian logistics. Therewith this paper is an application-oriented paper treating the potential of performance measurement for the humanitarian sector.

In this paper we first give an impression of the significance and actuality of the topic in the second chapter. For this purpose statistics about disasters and their consequences in 2011 are presented and an actual example from the year 2012 is given with the Sahel food crisis. The second chapter also gives a definition about humanitarian logistics and presents the aims and goals as an important foundation of performance measurement. A detailed state of the art is content of the third chapter treating as well first steps of research by the Fritz Institute as further researches and applications by other institutions. On the basis of the current state of the art a further framework for performance measurement in humanitarian logistics is presented in the fourth chapter by combining the topic performance measurement with existing process-oriented reference models. Over that some additional specific challenges for performance

[1] Cf. Thomas and Kopczak (2005).

[2] Cf. Thomas and Kopczak (2005), p. 10.

[3] Cf. Davidson (2006).

[4] Cf. World Bank (2012), available at: www.worldbank.org (accessed August 30th 2012).

measurement in humanitarian logistics are content of the fourth chapter. Finally a conclusion is given with some ideas for future research.

2 Humanitarian logistics – significance, definition and aims

2.1 Significance

In the actual Annual Disaster Statistical Review 2011 published annually by the Centre for Research on the Epidemiology of Disasters (CRED) is documented that in 2011 332 natural disasters were registered.[5] The human and economic impacts of the disasters were massive: Natural disasters killed more than 30 thousand people and caused 244.7 million victims worldwide. Economic damages from natural disasters were the highest ever registered, with an estimated US$ 366.1 billion. The earthquake and tsunami in Japan was the most expensive natural disaster ever recorded, with estimated economic damages of US$ 210.0 billion (see figure 1). The disaster that made the most victims in 2011 was the flood that affected China in June, causing 67.9 million victims. Furthermore, China was affected by a drought, a storm and another flood, contributing to a total of 159.3 million victims in China in 2011.[6] Other statistical data from the World Bank with the measured logistics performance indicator in different parts of the world will be content of the third chapter.[7]

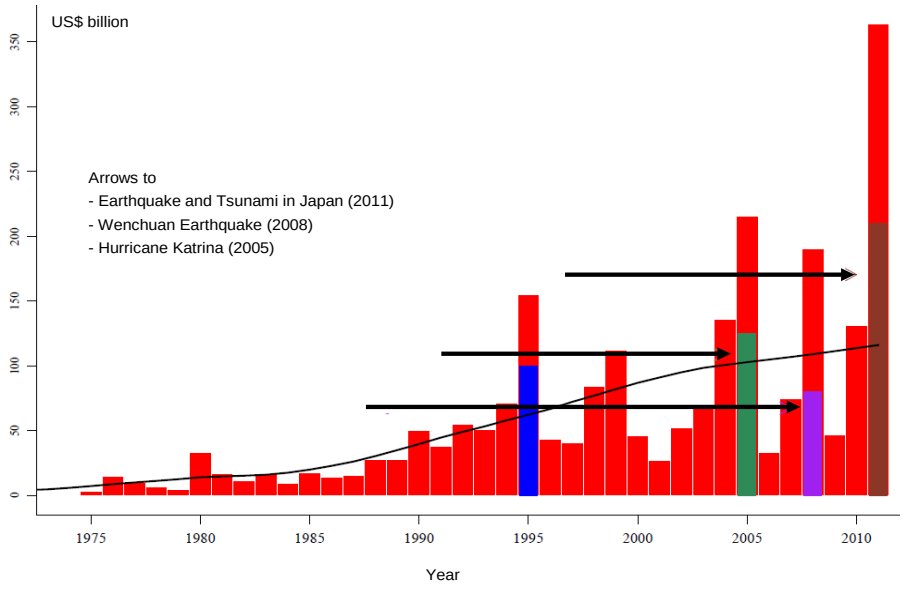

Figure 1 Estimated damage caused by reported natural disasters 1975-2011

One thematic frame is pointed out in the mentioned statistical review – drought and the complexity of its impacts: “As for almost every year, droughts strike everywhere on earth – their

[5] Cf. Centre for Research on the Epidemiology of Disasters (CRED), The International Disaster Database (2012), available at: www.em-dat.be (accessed August 30th 2012).

[6] Cf. Guha-Sapir et al., (2012).

[7] Cf. Arvis (2012); Chapter Three.

impacts increasing in magnitude and complexity due to the effects of a changing climate. Understanding the complex impacts of drought could be the key to enhancing drought mitigation and preparedness".[8] With a special view to the title of this paper performance measurement could be the key to understand the complex impacts of draught and with a special focus on humanitarian logistics it can be the key to enhance preparedness and therewith to lower the consequences for the affected people and countries. "The Sahel and West Africa are among the most vulnerable regions to future climate fluctuation".[9]

What was anticipated in the statistical review in fact has occurred during the year 2012. Many humanitarian agencies have been involved into the Sahel Food Crisis. To illustrate the complexity of the logistics operations we can have a look inside the Logistics Cluster, which is coordinated by the UN World Food Programme (WFP). The following citation is an extract from the Logistics Cluster Operations Weekly Update from August (3rd-9th):

"In Mali UNHCR has reported that over 250,000 refugees have fled northern Mali since January 2012. There are currently 167,000 Internally Displaced Persons (IDPs) in Mali. WFP rented a new warehouse in Bamako with a capacity of 12,000 mt Space may be available to the Logistics Cluster on request."[10]

Ports Situation in Somalia: "Dar Es Salaam – The port remains congested, with 4 vessels at berth, and 13 vessels at anchorage waiting to berth. Rehabilitation works on one of the container berths are on-going. Humanitarian vessels and car-carriers continue to be given berthing priority..."[11]

"South Sudan: Humanitarian organisations are working to meet the emergency needs of over 165,000 Sudanese refugees in Upper Nile and Unity States. The Logistics Cluster continues to respond to the urgent requests of the humanitarian community in both States with the transport of emergency medical, WASH, nutrition, and food items."[12]

"In Mauritania roads between Nema and Bassikounou remain impassable, with trucks stuck 80 km from Bassikounou due to heavy flooding. As of 08 August, there are more than 98,000 Malian refugees in Mauritania. With the onset of the rainy season, 700 metres of the 1000 metres of the Bassikounou airstrip remain operational, with 300 meters under water."[13]

The quotations give an impression which questions and challenges humanitarian aid organizations and logisticians have to deal with: Transportation has to be organized under complicated conditions like impassable roads, airstrips under water and congested sea ports, warehousing

[8] Guha-Sapir et al., (2012), p. 18.

[9] Guha-Sapir et al. (2012), p. 19.

[10] Logistics Cluster (2012), available at: www.logcluster.org (accessed August 30th 2012).

[11] Ibid.

[12] Ibid.

[13] Ibid.

has to be facilitated fast and flexible, several organizations are integrated into the operations in different countries, and they deal as well with different humanitarian commodities and infrastructure as with people. Performance Measurement won't avoid disasters like droughts, storms, floods, or earthquakes – but it can be the key to lower the amount of affected (also killed) people and economic damages by initiating a process of continual improvement.

2.2 Definition, aims and goals

Thinking about performance measurement in humanitarian logistics we first have to define humanitarian logistics. It is defined "as the process of planning, implementing and controlling the efficient, cost-effective flow and storage of goods and materials, as well as related information, from the point of origin to the point of consumption for the purpose of alleviating the suffering of vulnerable people. The function encompasses a range of activities, including preparedness, planning, procurement, transport, warehousing, tracking and tracing, and customs clearance".[14] This definition is adopted by several authors and organizations and corresponds with more general definitions with view to logistics management and supply chain management [15] with a special focus on "alleviating the suffering of vulnerable people".[16] Inside the definition some fundamental contents of this paper are already named "processes", "procurement" (sourcing) and "controlling" (in this paper with a special focus on performance measurement). In addition the aims and goals are part of the definition: "efficient, cost-effective" and "for the purpose of alleviating the suffering of vulnerable people".

Both, the private sector and the humanitarian sector, focus on the both logistical aims service and costs. For most humanitarian organisations a high logistic service has a higher priority than the logistics costs.[17] With a good or even optimal logistic service the supply is quick, save and reliable. If the right goods (e.g. food and non-food items, medicine items) are received by the right people (the most affected people) at the right place, at the right time (as fast as possible) and with the right quality (e.g. food items or medicine is not of less quality because of extreme weather conditions) than humanitarian logistics can contribute to alleviate the suffering of vulnerable people. Often it even can save lives. The "right" logistic costs (e. g. for infrastructure, human resources, food and non-food items) are part of the aims, as well. If humanitarian organizations lower the logistic costs they can use the budget for the core tasks of humanitarian aid.[18] With this the aim for humanitarian logistics can be defined as

[14] Thomas and Kopczak (2005), p. 2.

[15] Cf. Council of Supply Chain Management Professionals (CSCMP 2012), available at: www.cscmp.org (accessed August 30th 2012).

[16] Blecken (2010), pp. 57-61.

[17] Cf. Thomas (2003) and following publications from the Fritz Institute.

[18] A comparison of logistic costs and service indicators in different continents give Keßler and Schwarz (2011), p. 230.

maximizing logistic service under the restriction of a given logistic budget.[19] Performance Measurement for humanitarian logisticians must be geared to these aims. It opens up possibilities to measure the target achievement and therefore performance measurement provides the necessary information for improvement.

3 State of the art

3.1 Research and application by the Fritz Institute

The following state of the art is an application-oriented state of the art with a special view on performance measurement in humanitarian logistics. It excludes a state of the art concerning more general topics like those with an isolated view on performance measurement or performance measurement in logistics or supply chain management. For this purpose a reference to basic literature can be given.[20]

The first publications considering humanitarian logistics and performance measurement in humanitarian logistics were published by members of the Fritz Institute.[21] The initiative started in the year 2003 and has been published in several journals, papers and conference documentations mainly until the year 2007. The researches did not only focus on performance measurement but on humanitarian logistics as a comprehensive area of research. Since the Asian Tsunami in 2004 and Hurricane Katrina in the U.S. in 2005 logisticians from different countries and branches have drawn attention to the field of humanitarian logistics.[22] The researchers from the Fritz Institute analyzed external pressures on humanitarian logistics and worked out the main pain points in humanitarian logistics as a foundation for new strategies and actions which were named as the path forward.[23] Drawing from lessons learned from the commercial world they formed to support the disaster relief chain.[24]

The Fritz Institute identified

- three main *external pressures*: increasing needs, increasing donor expectations and calls for accountability,
- five central *pain points*: lack of recognition of the importance of logistics, lack of professional staff, inadequate use of technology, lack of institutional learning, limited cooperation and

[19] Cf. Boelsche (2009), p. 88.

[20] Cf. e.g. Arnold et.al. (2008), especially pp. 917-927 about performance measurement in logistics; Gaismayer, J. (2012); Henke, M. et. al. (2009).

[21] Cf. Fritz Institute (2012), available at: www.fritzinstitute.org (accessed August 30th 2012).

[22] Cf. Fritz (2007), p. 21.

[23] Cf. Thomas (2003), p. 8; Thomas and Kopczak (2005), p. 7.

[24] Cf. Thomas (2004).

- five strategies for a *path forward*: professional logistics community, standardized training, *performance measurement*, communicating about the strategic importance of logistics and technical solutions.[25]

Hence performance measurement was already recognized as an instrument for improvement and for closing the identified lacks in humanitarian logistics. With the use of metrics, aid agencies would have the chance to use actual performance as input into future operational plans, identify and eliminate causes of performance breakdowns, use analysis of current performance to inform about continuous improvement, use actual data to strengthen voice with donors, suppliers and logistics service providers and report performance to enhance the reputation.[26] With a view to the other components of "the path forward" performance measurement has also to be taken into account, e.g. standardized logistics training and certification as well as technical solutions must consider performance measurement. Performance measurement should empower the staff of humanitarian organizations to identify "which factors most affect cost, quality, complexity, risk and timelines",[27] thus they address the aims of humanitarian logistics already mentioned above.

The aims and goals are also a central content of the publication "*Key Performance Indicators*" (KPIs), which focuses solely on performance measurement in humanitarian logistics.[28] "A disaster relief operation involves trade-offs of speed, cost, and accuracy with regard to the type of goods that are delivered and their quantities. Balancing these trade-offs requires a means of measuring supply chain performance".[29] Four indicators have been developed as key performance indicators which measure logistic performance:

- appeal coverage (percent of appeal coverage and percent of items delivered),
- donation-to-delivery time (how long does it take for an item to be delivered to the destination country after a donor donated it, measured in mean and median number of days),
- financial efficiency (comparing the budgeted prices to the actual prices paid for the items delivered as one metric and expressing the ratio of the total transportation costs in comparison to the total costs for delivered items as another metric).
- assessment accuracy with a special focus on the first three indicators. [30]

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[25] Cf. Thomas and Kopczak (2005), p. 5-8.

[26] Cf. Thomas and Kopczak (2005), p. 10-11.

[27] Thomas (2003), p. 12.

[28] Cf. Davidson (2006).

[29] Davidson (2006), p. 1.

[30] Cf. Davidson (2006), pp. 4-5; on page 8 a scorecard for the Asian earthquake in 2004/05 has been built up as a re-created example.

This system of scorecards and metrics has been an initial attempt to place a framework for performance measurement in humanitarian logistics. "While there is clearly room for further research on this topic, this system is a first step towards relief organizations being able to gauge how well their supply chain are performing and how quickly beneficiaries are reached with aid".[31]

The publications of the Fritz Institute are documented in detail in this paper because they represent one of the most elaborated research and documentation in the area of humanitarian logistics and performance measurement in this sector until today. Some other constitutive publications exist but they are in the majority not as extensive.

3.2 Further research and application

Since building up the first framework of KPIs and scorecard for humanitarian logistics by Fritz Institute humanitarian logistics has been content of several research activities but in most cases not with a special view on performance measurement. Important research groups in the field of humanitarian logistics are considered in this second part of the state of the art.

A more general indicator for performance measurement in humanitarian logistics is the "*Logistics Performance Indicator*" (LPI) documented by the World Bank every two years.[32] The efficiency of a country's supply chain (in cost, time, and reliability) depends on specific features of its domestic economy and logistics performance. "It provides a simple, global benchmark to measure logistics performance, filling gaps in datasets by providing systematic, cross-country comparisons. A joint venture of the World Bank, logistics service providers, and academics, the LPI is built around a survey of logistics professionals. By asking freight forwarders to rate countries on key logistics issues it captures a broad set of elements that affect perceptions of the efficiency of trade logistics in practice".[33] Whereas countries like Singapore (Rank 1) and Germany (Rank 4) have high LPIs, countries of emerging and developing countries have much lower LPIs. E.G. Mauritania, which is mentioned in the introduction is ranked as 127 from 155 countries.[34] The LPIs six components include:

- The efficiency of the clearance process (speed, simplicity, and predictability of formalities) by border control agencies, including customs.
- The quality of trade- and transport-related infrastructure (ports, railroads, roads, information technology).
- The ease of arranging competitively priced shipments.

[31] Davidson (2006), p. 9.

[32] Cf. Arvis (2012).

[33] Arvis (2012), p. iii.

[34] Cf. Arvis (2012), p. viii.

- The competence and quality of logistics services (transport operators, customs brokers).
- The ability to track and trace consignments.
- The frequency with which shipments reach the consignee within the scheduled or expected delivery time.[35]

Especially Annex 3 with domestic LPI results, time and cost data are valuable for performance measurement in humanitarian logistics with a special view on different countries.[36] Keßler and Schwarz refer to the LPI in their analysis about humanitarian logistics in Africa and the challenges on the last mile.[37] After presenting this more general indicator for logistics in a global world we now come back to the centre of humanitarian logistics again.

Scientific and applied researches by *INSEAD* and its Humanitarian Logistics Group, documented in several case studies and journal articles[38], have been carried into a book "Humanitarian Logistics" by Tomasini and van Wassenhove (2009). Performance measurement is not a main part of this publication but it is a side issue of the chapter information and knowledge management. Tomasini and van Wassenhove deal with topics like visibility, transparency and accountability.[39] "Accountability identifies who is responsible for actions within the process and how well they are performed."[40] Hence it can be seen as a part of performance measurement. They have designed a four-step accountability cycle with the stages responsibility, action, reporting and responsiveness but KPIs, scorecards or other instruments which allow a measurement of performances have not been presented. The chapter knowledge management ends with the statement: "Though the knowledge produced within an organization is irreplaceable and extremely valuable, new sources of knowledge need to be considered to improve performance".[41] In an early journal article both researchers presented the idea of accountability and the accountability cycle in humanitarian supply chains.[42] In 2012 the Humanitarian Research Group of INSEAD published findings from an empirical survey which they generated in cooperation with the Humanitarian Logistics Association and its members. This is one of the few empirical overviews about humanitarian logistics and logisticians.[43] Some findings can be used as a foundation for performance measurement, or benchmarking. An example is the overview about the average amount of time logisticians partially or fully are

[35] Cf. Arvis (2012), p. 1.

[36] Cf. Arvis (2012), pp. 43-50.

[37] Cf. Keßler and Schwarz (2011), p. 230.

[38] Cf. INSEAD (2012), available at: www.insead.edu (accessed August 30th 2012).

[39] Cf. Tomasini and van Wassenhove, (2009) pp. 90-114.

[40] Tomasini and van Wassenhove (2009), p. 96.

[41] Tomasini and van Wassenhove (2009), p. 130.

[42] Cf. Tomasini and van Wassenhove (2004).

[43] Cf. Wassenhove and Allen (2012).

involved in different areas (in percent): Supply management is the area where people devote most of their working hours.[44] Other examples are replies to the questions "suggestions to improve the organizations logistics performance" and "most important areas for professional development".[45]

Several publications, especially dissertations which are published in a book series of the *Kühne Foundation* deal with humanitarian logistics (Tufinkgi 2006, Schulz 2009, Blecken 2010). Tufinkgi and Blecken both have built up reference models for humanitarian logistics. They refer to existing supply chain management frameworks and reference models like SCOR[46] but both of them decided to build up special reference models for humanitarian logistics. Processes which are characteristic of the humanitarian sector can be integrated into the specific model. But with a view on the title of this paper the reference models for humanitarian logistics are as complex that an integration of metrics for performance measurement had not been carried out. Short references to the needs of accountability, reporting and controlling are given.[47] By contrast some of the existing reference models from the private sector integrate relevant KPIs or other performance figures to the model and processes (see chapter four).

The Kühne Foundation is also a member of the working group Humanitarian Logistics founded by the *German Logistics Association* (BVL) in 2010. Members of the working group are representatives from the humanitarian sector and the private sector, researchers and other organizations.[48] Central results from the working groups have been published. One working group has concentrated on "processes" as one of three main topics[49] but performance measurement wasn't a central topic because the working group has focused on the humanitarian processes and the interfaces across the chain. Some of the publications refer to performance measurement, e. g, Ngewe a researcher from Tansania who deals with logistical preventive measure[50] or Martinez from the private sector who describes best practices in case of disasters.[51] Some other publications can be analyzed with the expected impact on performance indicators, e.g. the GoHelp initiative of DHL "make airports ready for disaster"[52] can be a relevant activity to increase the Logistics Performance Indicator (LPI) of developing countries. But altogether performance measurement is not a central topic of the mentioned publication.

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[44] Cf. Wassenhove and Allen (2012), p. 14.

[45] Wassenhove and Allen (2012), pp. 19-20.

[46] Cf. e.g. Blecken (2010), pp. 80-114.

[47] Cf. e.g. Blecken (2010), p. 219.

[48] see detailed information in Baumgarten (2011).

[49] Cf. Hellingrath (2011).

[50] Cf. Ngewe (2011).

[51] Cf. Martinez (2011).

[52] Cf. Meier (2011).

The last statement can be transferred to publications in the *Journal of Humanitarian Logistics and Supply Chain Management*, first published in 2011.[53] The journal promotes the exchange of knowledge, experience and new ideas between researchers and practitioners and encourages a cross-functional approach to the resolution of problems and exploitations of opportunities within humanitarian supply chains – but performance measurement has been a side issue in the years 2011 and 2012. Inside another Emerald Journal, the International Journal of Public Sector Management, one relevant publication can be found about performance measurement in humanitarian relief chains with a comparison between performance measurement in the humanitarian relief chain with performance measurement in the commercial supply chain. Performance metrics and a framework for performance measurement have been developed for the humanitarian relief chain.[54]

A deeper analysis of evaluation and performance management has been worked out by *ALNAP*, the Active Learning Network for Accountability and Performance in Humanitarian Action.[55] In their papers, evaluation and case studies these topics are a central content:

- The researchers have worked out general overviews about the understanding, use and improvement of evaluation.[56]
- Studies about the state of the humanitarian system have been worked out with a special view on performance and progress, but these studies concentrate on a global overview and not on performance measurement as an instrument for the organizations themselves.[57] As central indicators the study considers coverage/sufficiency, relevance/appropriateness, effectiveness, connectedness/capacity building, efficiency, and coherence.[58]
- A guide for real time evaluation has been published which refers to indicators comparable to the ones mentioned in the bullet above.[59]
- The organization has dealt with the question how general data, especially from the OECD can be used to evaluate humanitarian action.[60]
- Most relevant for this paper is a study about performance and effectiveness in the humanitarian sector under the headline "counting what counts".[61] In this study the au-

[53] Cf. Emerald (2012), available at: www.emeraldinsight.com/products/journals/ (accessed August 30th 2012).

[54] Cf. Beamon and Balcik (2008).

[55] Cf. Active Learning Network for Accountability and Performance in Humanitarian Action (ALNAP 2012), available at www.alnap.org (accessed August 30th 2012).

[56] Cf. e.g. Hallam, A. (2011).

[57] Cf. e.g. Harvey P. et. al. (2010).

[58] Cf. Harvey P. et. al. (2010), p. 15.

[59] Cf. Cosgrave, J. (2009).

[60] Cf. ALNAP (2006).

thors have not only dealt with indicators but in addition with wider concepts, especially the balanced scorecard.[62]

After the first steps of Fritz Institute in the direction of performance measurement in humanitarian logistics further developments have been worked out but not as extensive as it could have been expected. This is the starting point for the next chapter.

4 Specific challenges for performance measurement in humanitarian logistics

4.1 Humanitarian performance: Definition and challenges

Performance measurement in humanitarian logistics requires a fundamental *definition* of *humanitarian performance*. This paper refers to an existing definition which matches the understanding of humanitarian logistics given in this paper (see chapter 2):

Humanitarian performance is "the effective collective performance of a complex system of international, national and locally-based organisations, which works to save lives, alleviate suffering and maintain human dignity both during and in the aftermath of man-made crises and natural disasters, as well working to prevent and strengthen preparedness for the occurrence of such situations."[63] In addition "effective performance means undertaking work in ways that are consistent with humanitarian principles, mobilising and deploying sufficient financial, material and human resources in ways that are relevant, well-managed, accountable, impartial, durable and ensure good quality".[64]

The definition gives an impression that measuring performance with a humanitarian focus is *more than collecting indicators* or metrics, such as the mentioned key performance indicators or logistics performance indicators (see chapter 3). The definition above refers to a complex system which includes several organisations and actors. The necessity is given to consider connections and relationships across logistical processes and the whole supply chain. In addition performance management should not only focus on the end of the supply chain but also on former processes, because the performance of these processes influence the overall performance, as well.

The Active Learning Network for Accountability and Performance in Humanitarian Action has worked out four central requirements for performance measurement in Humanitarian Action: "*coherent, integrated, consistent and comprehensive*".[65]

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[61] Cf. Ramalingam and Mitchell (2009).

[62] Cf. Ramalingam and Mitchell (2009), pp. 20, 39, 76.

[63] Ramalingam and Mitchell (2009), pp. 48-49.

[64] Arnold (2008), pp. 917-927.

[65] Ramalingam and Mitchell (2009), p. 78 with detailed explanations on pp. 77-83.

First approaches meeting these requirement have been presented by first scorecards developed e.g. by the Fritz Institute [66], but this scorecard is rather a collection of indicators than the dealing with correlations.

Few publications keep further challenges in mind and integrate the indicators and other contents of performance measurement in humanitarian logistics in *wider concepts like the balanced scorecard*. The balanced scorecard has been originally developed by Kaplan and Norton in the 1990th. It translates a company's vision and strategy into a coherent set of performance measures. The four perspectives of the scorecard – financial measures, customer knowledge, internal business processes, and learning and growth – offer a balance between short-term and long-term objectives, between outcomes desired and performance drivers of those outcomes, and between hard objective measures and softer, more subjective measures.[67] This approach has been adapted with first considerations to the humanitarian sector. The perspectives of the scorecard are denominated as five perspectives: impact, stakeholders, process, resource and organizational capacity.[68]

The balanced scorecard is a first approach for humanitarian logistics considering different perspectives like the process perspective, different actors and not only the past but also future expectations about indicators. In addition it tries to identify connections and correlations between the indicators – a requirement which succeeds rarely in the practical application of the balanced scorecard – and the influence of indicators on aims and goals, strategy and vision and with this on the impact of humanitarian logistics.

But what is still largely missing is the *integration* of the mentioned (and other) *indicators into process models of logistics* and supply chain management. This is a challenge for the future research on performance measurement, especially in the process-oriented humanitarian *logistics.*[69] On the basis of the current state of the art a further framework for performance measurement in humanitarian logistics is presented in the following by combining the topic performance measurement with existing process-oriented reference models, especially the SCOR (Supply Chain Operations Reference) model.

4.2 Process-orientation in performance measurement for humanitarian logistics – with a special view on SCOR

Processes and the linkage between processes are one of the central issues of humanitarian logistics research and its practical implementation. This still has been founded in this paper,

[66] Cf. Davidson (2006).

[67] Cf. e. g. Kaplan and Norton (1996) and with a special focus on logistics Arnold et. al. (2008), pp. 919-920.

[68] Cf. Ramalingam and Mitchell (2009), especially p. 76.

[69] Cf. Arnold et. a. (2008), p. 215.

e.g. with a view on the working group "processes" of the German logistics association[70] and the development of reference-models for humanitarian logistics.[71]

With these research activities and publications the documentation of logistical processes and the supply chain for humanitarian activities is developed on a high academic level. But in this paper the process-oriented performance measurement framework doesn't base on the reference-models specifically worked out for the humanitarian sector but on a more general model for supply chain management, the SCOR model in the current version 10.0.[72] This supply chain operations reference model has been developed in 1996 by the Supply Chain Council (SCC), a global non-profit organization.[73] The SCOR model is a global standard for supply chain management, "a model that provides a unique framework for defining and linking performance metrics, processes, best practices, and people into a unified structure".[74]

One expected question should be answered before going more in detail: Why does this paper focus on the standard model developed with a private and special industrial view and not on the models created individual for the humanitarian sector? Two main answers can be given to this question:

- First of all, SCOR is composed of three components: Not only *process modelling* is considered (as it is documented by the reference model for humanitarian logistics) but also *performance measurement* and *best practices*.[75] Therewith a basis for integrating metrics into the process model is given – which of course has to be adapted to the humanitarian sector, e.g. considering different impacts, aims and goals and in consequence adapted indicators.
- Secondly, the standard model is an *inter-branch* standard process reference-model and offers the integration of organizations from different sectors, such as the industrial sector, retail and (logistic) service providers. If an involvement of the humanitarian sector into the SCOR model succeeds than the complete humanitarian supply chain can be considered with actors from the humanitarian sector (e.g. Non Governmental Organizations, NGOs) and actors from the private sector (e.g. suppliers, manufacturers). A basis to measure and analyze the influence of each organizations performance on the performance of the whole supply chain would be developed and could be applied for performance improvement.

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[70] Cf. Hellingrath (2011).

[71] Cf. Tufinkgi (2006); Blecken (2010), for further information about different SCM frameworks and reference models see Blecken (2010), pp. 80-114.

[72] Cf. Supply Chain Council (2012).

[73] Cf. Arnold (2008), p. 227.

[74] Supply Chain Council (2012), available at www.supply-chain.org (accessed August 30th 2012).

[75] Cf. Arnold (2008), p. 228; Blecken (2010), S. 106; Supply Chain Council (2012), p. 6.

As it is illustrated in figure 2 the model spans over the supply chain from suppliers and their supplier's supplier over the own organization to customers and the customer's customer. Within the framework five distinct management processes are considered: source, make, deliver, return and plan.[76]

Figure 2SCOR 10.0, First level
[Supply Chain Council 2012, p. 6]

The SCOR model breaks down each of the management processes – visualized in figure 2 on the first level – at various organisational levels and establishes metrics at each of these levels.[77]

After the Haitian Earthquake the Supply Chain Council has analyzed itself, if the SCOR model can be adopted by humanitarian organizations with the question: "Can the SCOR model be applied to humanitarian aid?" But only one resource could be identified by the author of this paper – a short presentation about some general findings,[78] which doesn't answer the question in detail. Some similarities and differences between the commercial and the humanitarian sector are enumerated in a short list.[79]

In this paper a first framework should be developed on the higher levels of SCOR considering the necessary modifications of the model when using it for performance measurement in humanitarian logistics. Starting on the first level:

- Some of the *terminologies* should be changed with special focus on the actors in a humanitarian chain, e.g. "customer". The organization in the centre could be a *NGO organization* (or several NGOs), the suppliers could be – in dependence from the needed items – the agriculture industry, the pharmaceutical industry, the food industry

[76] Cf. Supply Chain Council (2012); Blecken (2010), pp. 105-106; Bölsche (2009), pp. 212-213.
[77] Cf. Arnold (2008), p. 227-228; Blecken (2010), p. 105; Supply Chain Council (2012).
[78] Cf. Supply Chain Council (2010).
[79] Cf. Supply Chain Council (2010), p. 23.

or others suppliers with relevance for humanitarian aid, and the ultimate customers should be dominated as *beneficiaries* or affected people.

- Another group of "customers" or stakeholders in humanitarian logistics are *donors*. They influence the budget for humanitarian logistics and in some cases donate items or services for humanitarian aid. In addition, they have special demands on the reporting and accounting system. Donors are not considered in the original SCOR model but have to be considered in an adaption for the humanitarian sector along the whole supply chain.
- In most cases "*make*" in the sense of "production"-processes aren't relevant for NGOs, and they can be disregarded for service providers (NGOs, logistics service providers and others) or they can be regarded as "make to order" processes. All other processes are to a great extent relevant for the actors in humanitarian aid: source, deliver, return (this process is needed especially in the aftermath of a disaster) and plan (as well for each organization as for the whole supply chain).

The following figure 3 considers the above mentioned requirements concerning the terminologies, integration of donors, and production processes. For a better understanding and with reference to the Sahel food-crisis (see chapter 2) it illustrates a simplified example with a special view to the United Nations World Food Programme (WFP), which reached in 2011 99.1 million people in 75 countries and provided 3.6 million metric tons of food.[80] This approach can be transferred to other humanitarian supply chains.

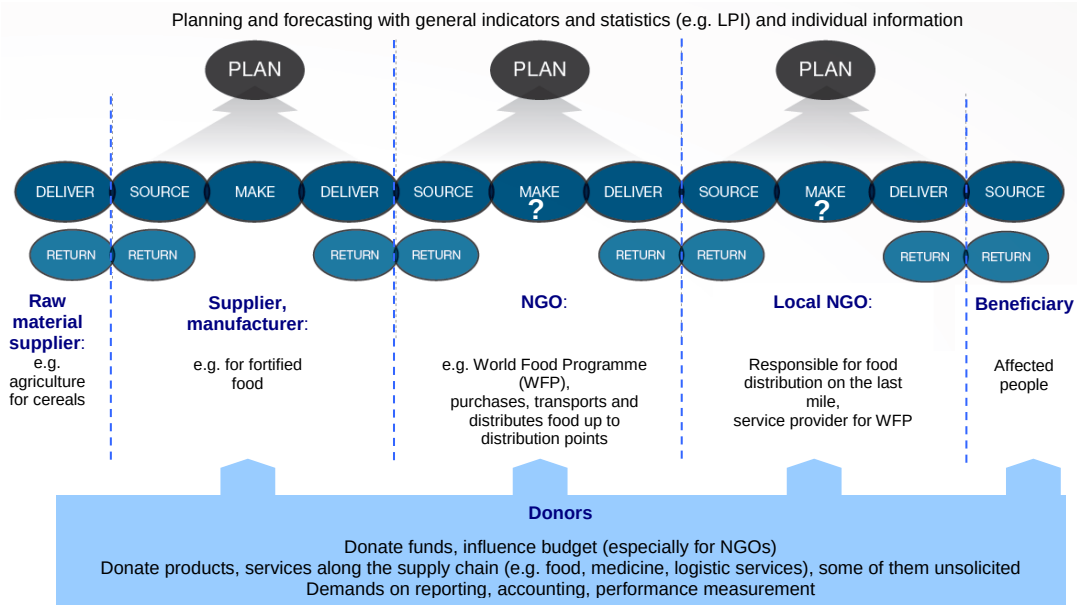
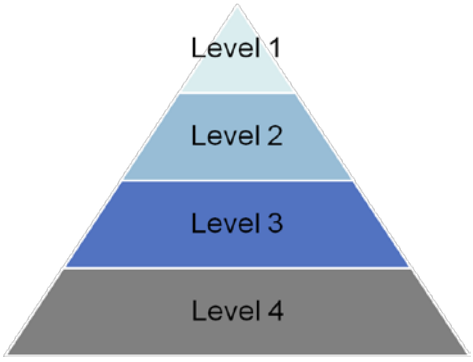


Figure 3SCOR 10.0, First level, Example food supply chain

[80] for more information about WFP and the situation in the Sahel see www.wfp.org.

With a special view on performance measurement in humanitarian logistics, SCOR Level 1 metrics are strategic, high-level measures that cross multiple SCOR processes.[81] They can be adjusted to the organizations in the humanitarian supply chain. On the more detailed levels two and three the processes are defined and described more and more extensive, e.g. with input and output relationships and a foundation for benchmarking and best practice analysis. For the purpose of performance measurement level two includes five performance attributes and level three more detailed metrics, which are linked with the performance attributes. Performance attribute are used to express a strategy, they cannot be measured itself. Metrics measure the ability of a supply chain to achieve these strategic attributes.[82] Most of the attributes and metrics can be applied for humanitarian logistics, some are not relevant (especially when detailing make processes) and some have to be defined in addition (attributes and metrics concerning donors in the whole supply chain). This hierarchical structure is illustrated in the following figure 4 in consideration of performance measurement in humanitarian logistics.



Highest level with **five core processes**: source, make, deliver, return and plan, see figure 2 and 3. **Performance goals** have to be adjusted to humanitarian logistics.
Five core processes are differentiated into **26 process categories**. Not all of them are needed in humanitarian logistics. **Performance attributes**: reliability, responsiveness, agility, costs, assets
Single processes with definition and description, input-, output relationships. **Metrics** with linkage to performance attributes. With regard to **benchmarking**, best practices and available Software.
Level four can be implemented for further **individual requirements**. It isn't part of the standard but provides additional space for individual complement, in this case sector-specific (humanitarian aid) or organization-specific (e.g. WFP).

Figure 4 SCOR 10.0, Different hierarchical levels

A view into level two and its performance attributes exhibits that these attributes[83] are generally in accordance with the key performance indicators created by the Fritz Institute for humanitarian logistics:[84]

- *Responsiveness* attribute (describes in SCOR level two the speed at which tasks are performed) corresponds with *donation-to-delivery time* (Fritz Institute).
- *Agility* attribute (describes in SCOR level two the ability to respond to external influences and the ability to change) isn't part of the KPIs developed by the Fritz Institute but is of high relevance for humanitarian logistics.

[81] Cf. Supply Chain Council (2012).

[82] Cf. Supply Chain Council (2012), pp. 6-10.

[83] Cf. Supply Chain Council (2012), p. 7.

[84] Cf. Davidson (2006); see also chapter three.

- *Costs* attribute (describes in SCOR level two the costs of operating the process) and *assets* attribute (describes in SCOR level two the ability to efficiently utilize assets) are consolidated in Fritz Institute KPIs to *financial efficiency*.
- *Reliability* attribute (describes in SCOR level two the ability to perform tasks as expected) corresponds with *assessment accuracy* (Fritz Institute).

This comparison shows that the differences between performance measurement in commercial logistics and humanitarian logistics are not as large as it could be expected at first view. Both sectors have different impacts, aims and goals and with this they have different ambitions concerning the degrees of fulfilment. But the relevant attributes, metrics and indicators are to a great extent consistent with each other. Because of the linkages between level two attributes and level three metrics this statement holds for level three, as well. In consequence the SCOR model can be an adequate instrument for performance measurement in humanitarian logistics.

Some further topics are not part of this paper, e.g. a detailed view into levels three and four, a more critical analysis of the SCOR model a discussion about quantitative metrics and performance indicators, so that first ideas for future research and application are given.

5 Conclusion

Which innovation does this paper provide to performance measurement in humanitarian logistics? The introduction into this paper refers to the actual situation in the African Sahel – a region which is denominated by the newest Disaster Statistical Review as the most vulnerable region to future climate fluctuation. Performance measurement can be one of the keys to enhance preparedness and real time performance in regions like the Sahel. Especially in regions where disasters occur frequently, performance measurement is a useful instrument for continuous improvement. Not only the Sahel is counted along such regions because of the expected droughts, but also regions which are affected by hurricanes (e.g. the U.S.), earthquakes (e.g. Japan and China) and floods (e.g. Pakistan). The instrument of performance measurement is not able to avoid the occurrence of disasters, but with each step of improvement the aims of humanitarian logistics could be achieved on a higher level – and in consequence it contributes to alleviate the suffering of the affected people.

As a first consideration in chapter three performance measurement was identified as one of the “pain points” in humanitarian logistics. In this paper some considerations how to reduce the lack have been worked out. After dealing with statistics and performance indicators such as the Annual Disaster Statistical Review by CRED and the Logistics Performance Indicator by the World Bank some ideas are created which general global metrics, indicators and data about disasters and logistics are available and can be used for performance measurement. Even though future demand in humanitarian aid and humanitarian logistics will be uncertain such information can be integrated into planning activities along the whole supply chain. Over

that, wider concepts of performance measurement, successfully implemented by the private sector, have been presented: In a short overview the balanced scorecard and more detailed the process-oriented SCOR model.

This paper gives several ideas for future research and the application in practice: E.g. the integration of statistics and indicators into planning and forecasting, working out the SCOR model for humanitarian logistics in detail, its practical implementation, and questions concerning the intersectoral collaboration.

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