

A theoretical framework for consolidation in humanitarian logistics

Vaillancourt, A

Author post-print (accepted) deposited by Coventry University's Repository

Original citation & hyperlink:

Vaillancourt, A 2016, 'A theoretical framework for consolidation in humanitarian logistics' *Journal of Humanitarian Logistics and Supply Chain Management*, vol 6, no. 1, pp. 2-23

<https://dx.doi.org/10.1108/JHLSCM-01-2015-0001>

DOI 10.1108/JHLSCM-01-2015-0001

ISSN 2042-6747

Publisher: Emerald

Copyright © and Moral Rights are retained by the author(s) and/ or other copyright owners. A copy can be downloaded for personal non-commercial research or study, without prior permission or charge. This item cannot be reproduced or quoted extensively from without first obtaining permission in writing from the copyright holder(s). The content must not be changed in any way or sold commercially in any format or medium without the formal permission of the copyright holders.

This document is the author's post-print version, incorporating any revisions agreed during the peer-review process. Some differences between the published version and this version may remain and you are advised to consult the published version if you wish to cite from it.

A theoretical framework for consolidation in humanitarian logistics

Purpose

The aim of this study is to develop a theoretical framework to better understand incentives and obstacles to consolidation of materials in humanitarian logistics.

Methodology

This study uses a content analysis for its literature review method to code 87 articles related to supply chain and logistics and understand what are the incentives and obstacles to consolidation. It then discusses these issues from the point of view of humanitarian logistics.

Findings

Through the combination of a literature review and discussion, the framework developed in this conceptual paper identifies specific sources of delays and impediments to cooperation present in disaster response and development activities. These issues can be related to disaster type, the focus of the organization and the stakeholders as well as the resources required for consolidation themselves.

Research limitations

There are limitations to a conceptual paper, one being the lack of empirical proof for the findings. Another limitation is the use of coding; even though the coding grid was iterative to take into account the findings in the literature, there might still be shortcomings inherent to the categories.

Originality

This study offers a comprehensive review of consolidation activities in the last decades and offers an abstract model to further investigate consolidation in the context of humanitarian logistics.

Keywords: Consolidation, supply chain, humanitarian logistics, framework, literature review, content analysis.

Conceptual paper

Introduction:

The environment in which humanitarian organizations operate offers a complicated set of challenges such as an unpredictable demand (in terms of timing, location, type and size), sudden occurrences of large demands with short lead times for different supplies, the importance of timeliness in deliveries and a lack of resources (material, human, technology and financial) (Balcik & Beamon, 2008). Meanwhile, logistics represent an important cost, sometimes upwards of 80% (Trunick, 2005) of a programme budget for these organizations or up to 40% of operation costs compared to 15% for logistic activities in the commercial sector (Whiting & Ayala-Ostrom, 2009) depending on what is considered transportation costs. Since multiple humanitarian organizations can be involved with a response to an event and have the same overall goals of helping the affected population, there is an opportunity for them to combine their activities in order to offer a better response. Coordination in humanitarian logistics is a well-researched topic (Balick, et al., 2010; Jahre & Jensen, 2010; Akthar, et al., 2012) and one approach to coordination is to regroup materials together through consolidation. The aim of this study is to develop a theoretical framework to better understand incentives and obstacles to consolidation of materials in humanitarian logistics through a review of appropriate writings leading to the development of a theoretical framework.

Frameworks offer the possibility to simplify a representation of reality and help in the elaboration of theories (Meredith, 1993). The framework in this study not only addresses a topic understudied in the literature but helps present the different relevant issues at hand and how they interact with each other. An overall picture of the incentives and obstacles can lead to more empirical field work and to a better understanding of the relevant literature for humanitarian logistics. This can be done by offering new ways of interpreting data as well as defining research problems. It also offers practitioners a better understanding of the general considerations behind the management of consolidation materials and how they can address them depending on their own context. The framework in this research applies to a specific instance of coordination in context of humanitarian logistics. Disaster relief is identified as one setting that significantly affects supply chain design decision and features (Melnik, et al., 2014). The precise specifications of the framework lead to a construction of a middle level abstraction model as it explains a limited set of phenomena (Wacker, 1998). As such it focuses on a conceptual

description which identifies relevant concepts and propositions (Meredith, 1993) relative to consolidation in humanitarian logistics. This answers the call for more theory building according to three dimensions relevant in humanitarian logistics (network - coordination – structure) identified by Jahre et al. (2009) as consolidation essentially consists of the management of a centralized coordination structure. Finally, the type of challenges brought about by the context for humanitarian logisticians is based on a further model put forward by Kovács & Spens (2009). To study a topic as broad as consolidation, a content analysis method is used to examine relevant articles. The first section of this article briefly discusses consolidation in the business literature, coordination literature in humanitarian logistics as well as the general concepts put forward by different theoretical models developed by previous authors. The second section then presents the methodology behind the content analysis developed to analyze the literature discussing consolidation. The third presents the analysis of the results. Finally the fourth section discusses a theoretical framework that identifies how consolidation can take place in humanitarian logistics.

Humanitarian logistics coordination and frameworks:

Consolidation of material is one of the possibilities that are available to organizations to gain economies of scale (Cooper, 1984; Gray, et al., 1992; Trent & Monczka, 1998) and other performance benefits in their supply chain activities. Consolidation is a topic that is generally understood in the business literature as combining certain activities or materials that have common attributes to improve the overall performance of firms. Consolidation can range from market consolidation in which companies combine their assets and activities (Zyl, 1992; Wu & Chou, 2007; Manuj & Mentzer, 2008), to information technology systems where companies integrate different software packages (Davenport, et al., 2004; Mahato, et al., 2006; Grosswiele, et al., 2013). For the purpose of this study, consolidation is viewed in the context of materials management where materials are regrouped together physically through management activities. This type of consolidation consists of inventory, transportation and purchasing activities (Brauner & Gebman, 1993). In this context, specific definitions of consolidation exist. Inventory consolidation is stocking items at a single facility which satisfies all demand (Wanke & Saliby, 2009). Transportation consolidation is the dispatch of small amounts of material in a single large more economic load (Çetinkaya, 2005). Purchasing consolidation occurs when purchases are regrouped to gain certain benefits (Monczka, et al., 1993).

Even though consolidation is present in humanitarian operations, there is little to no literature regarding the practice of consolidation of goods in humanitarian logistics with Schulz and Blecken mentioning it as a side effect of horizontal cooperation (Schulz & Blecken, 2010). Cooperation and coordination are well discussed topics in humanitarian logistics literature and consolidation can be considered as a specific sub topic. Balcik et al. discuss coordination in humanitarian logistics through the different coordination mechanisms that cover purchasing, warehousing and transportation and put forward the critical role of coordination as well as the increased partnerships found in humanitarian logistics (Balick, et al., 2010). Altay also notes the importance of coordination as one of the different issues of humanitarian supply chains alongside funding issues, needs assessment and procurement, management of information, transportation infrastructure and network design and standardization of relief (Altay, 2008). Akthar et al. discuss the importance of tangible and intangible assets and how coordination is successful if coordinators are successfully matched (Akthar, et al., 2012). Jahre et al. develop a theoretical framework for humanitarian logistics that include both vertical and horizontal coordination (Jahre, et al., 2009). Jahre and Jensen further investigates the challenges of vertical and horizontal cooperation in humanitarian clusters where limited resources force tradeoffs between intercluster and intracluster coordination (Jahre & Jensen, 2010). Kovács and Spens put forward the importance of coordination and collaboration between regional and extra-regional actors at different steps of the disaster phase (Kovács & Spens, 2007). Stephenson and Schnitzer point out that coordination takes place within a relational network under conditions of competition and confusion (Stephenson Jr. & Schnitzer, 2006). Chandes and Paché put forward coordination as significant for cost savings in humanitarian logistics but limited because of the competition for funding (Chandes & Paché, 2010). Dolinskaya et al. offer some insights on strategies to facilitate coordination (through web-based systems, membership subscription, mechanisms to mitigate risk and costs allocation, easy to use sharing and information tools and feedback mechanisms to facilitate learning) as well as challenges for consolidation (large number and diversity of participants, urgency of relief and limited time for coordination, limited information sharing and communication, allocation of costs and benefits and limited personnel dedicated to coordination) (Dolinskaya, et al., 2011). The challenges to collaboration are also reviewed by Feng et al. who identify as challenges the number and diversity of actors, donor expectations, competition, effects of the media, unpredictability, resource scarcity or oversupply, cost, determining and

dividing gains and lack of standardization (Feng, et al., 2010). Schulz and Blecken assess the benefits and impediments of horizontal cooperation by basing themselves on research by Cruijssen et al. and whose findings were used for coding in this research (Cruijssen, et al., 2007; Schulz & Blecken, 2010). **Bhattacharya et al. put forward the importance of collaboration and centralization in asset transfers in humanitarian supply chains to reduce gaming between actors (Bhattacharya, et al., 2014).** Altay and Pal use agent-based modeling to emphasize the importance of the UN clusters in managing information sharing (Altay & Pal, 2014). Battini et al. extend a routing model of last mile distribution for the 2010 Haiti earthquake and show that co-transportation can have a higher level of cost performance (Battini, et al., 2014). Benini et al. study the role of coordination actors during the 2005 Pakistan earthquake and found that **coordination of cargo and matching towards needs assessment varied according to the commodities and disaster phase (Benini, et al., 2009).** Moore et al. when investigating the 2000 Mozambique flood found that organisations with higher potential to cooperate had a higher, on average, number of beneficiaries (Moore, et al., 2003).

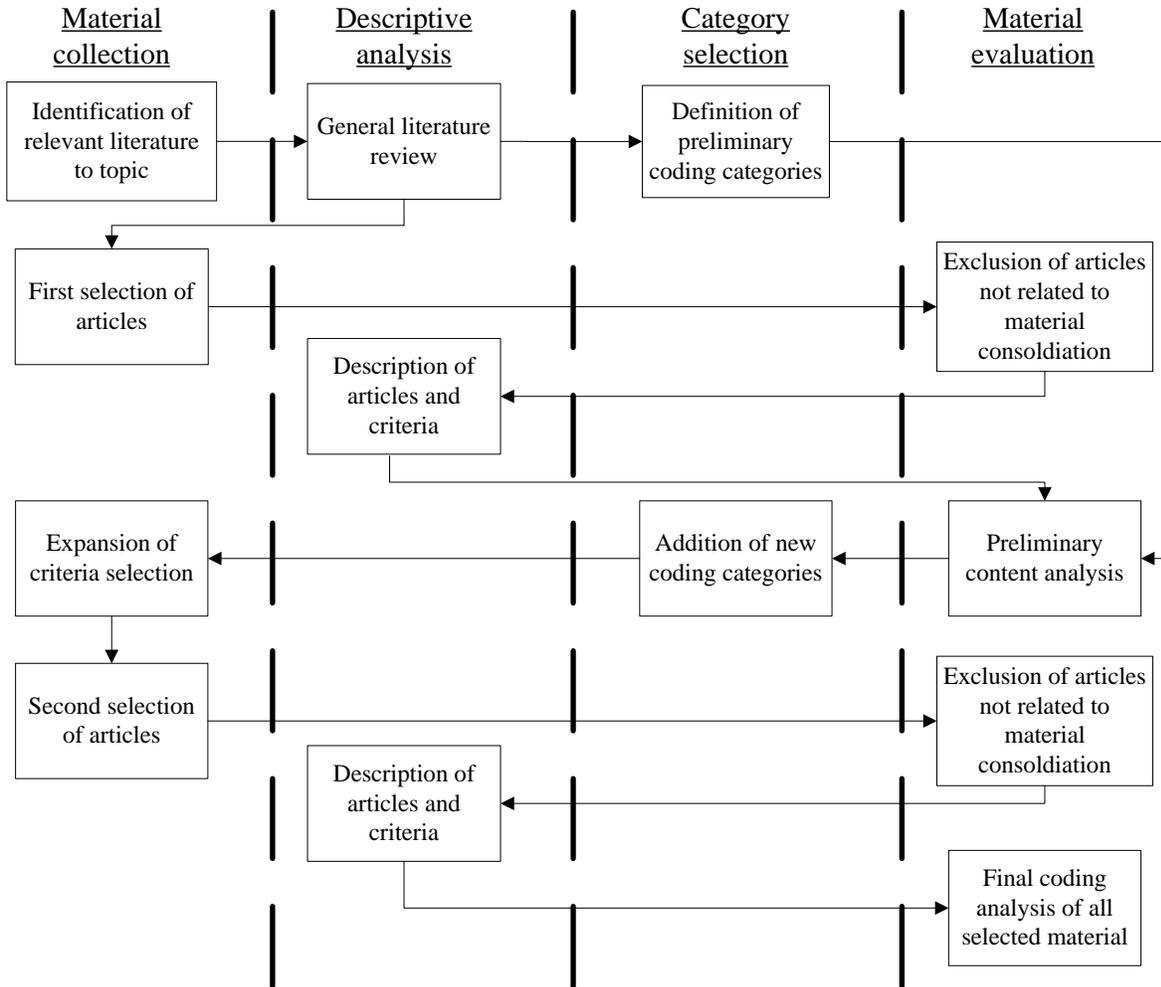
Logistics and supply chain analytical frameworks are common in the business oriented literature and address various topics such as integrated supply chains (Stank & Goldsby, 2000), build-to-order supply chains (Gunasekaran & Ngai, 2005) and supply chain vulnerability (Peck, 2005). There are different frameworks in humanitarian logistics (Kovacs & Spens, 2009; Jahre, et al., 2009; Ertem, et al., 2010; Overstreet, et al., 2011) and they use different levels of abstraction in how they develop the various concepts. Jahre et al. (2009) put forward a high abstraction model which identifies theory development possibilities through different dimensions (Jahre, et al., 2009). These dimensions comprise types of structure (decentralized/ centralized), coordination (vertical/ horizontal) and network (permanent/ temporary). This paper contributes towards fulfilling the identified need for theory development by focusing on consolidation, presenting a case of coordination from a centralized point of view when materials of multiple actors are regrouped together. This can be done in both permanent and temporary networks with permanent networks used for development activities while temporary ones are used for disasters and other emergencies. Overstreet et al. (2011) also suggest another framework for further research which puts a greater emphasis on the elements of humanitarian logistics where humanitarian relief is the primary driver of input and output while the secondary input consists of monetary resources with secondary outputs as plans, relationships, lessons learned and

experience (Overstreet, et al., 2011). The humanitarian logistics elements include the organization's personnel, equipment/ infrastructure, transportation, information technology/ communication, planning/ policies/ procedures, and inventory management (Overstreet, et al., 2011). In our paper, the output is consolidation and the inputs are resources. The most relevant conceptual framework for the discussion of this research helps in identifying challenges in humanitarian logistics and is developed by Kovács and Spens's (2009). This model describes the challenges faced by humanitarian logisticians according to disaster types, focus and location of the organizational and the role of stakeholders. To identify the relevant indicators of resources, incentives and obstacles a content-analysis of the relevant literature was done.

Content-analysis methodology:

Content analysis is a research methodology that uses coding to study the meaning and context of a pre-selected literature (Cullinane & Toy, 2000; Seuring & Gold, 2012). The type of literature that is analyzed is either an academic literature or other types of texts (Cullinane & Toy, 2000); this is done in both cases for the purpose of scientific analysis in a multitude of fields which leads to multiple types of content analysis (Seuring & Gold, 2012). Because of this, there is a need to define the general approach for the content analysis of this study which follows the approach proposed for supply chain research by Seuring & Gold based on previous works by Mayring (Mayring, 2008) and is composed of four different steps. These steps consist of the delimitation of the material, assessing the characteristics of the material, defining the structural dimensions of the coding to apply it to the material and finally the analysis of the material (Seuring & Gold, 2012). Each of these step have different practical considerations and activities (figure 1) that can be iterative and which are explained below.

Figure 1: Content analysis methodology steps in this study.



The relevant literature for this framework is academic publications on the topic of supply chain and logistics. A preliminary review of selected materials discussing the word “consolidation” and associated notions provided material to define the preliminary coding categories and help with the first selection of articles (figure 2 below). The keywords of “logistics” and “supply chain management” were chosen for their wide coverage of the topic while “humanitarian logistics” was chosen for its relevance to humanitarian activities. Other preliminary relevant articles included articles on “distribution” (Fein & Jap, 1999), consolidation in “purchasing” (Trent & Monczka, 1998), “warehousing” (Rouwenhorst, et al., 2000), “transportation” (Çetinkaya & Bookbinder, 2003) and “third party logistics” or “3pl’s” (Yan, et al., 2003; Knemeyer & Murphy, 2004). The search was based on a subset of journals identified as the most relevant periodicals for academics in the area of logistics and supply chain management (Gibson & Hanna, 2003; Menachof, et al., 2009). For the first phase of the content

analysis, the five highest ranked periodicals from Gibson & Hanna and Menachof, et al. were chosen as well as the Journal of Humanitarian Logistics and Supply Chain Management for the relevance of its topic. The search was done on all text fields of the articles which yielded an important amount of material. This required the elimination of irrelevant articles and was done through reading the abstracts as well as searching through the documents for the passages discussing consolidation. If the article did not contain at least one paragraph discussing the consolidation of materials it was removed. This led to a first set of 50 articles which were read to understand the context of the material consolidation as well as a description of the incentives and obstacles. This was followed by a first coding of the material as well as additions of indicators to preliminary coding categories.

The first coding category identifies the type of resources required for consolidation in the form of decision making knowledge or infrastructure usage. The indicators of knowledge for transportation are pure dispatch consolidation with time based or quantity based shipment withholding or integrated inventory with outbound or inbound shipment consolidation (Çetinkaya, 2005). The indicators of knowledge for purchasing consolidation are the consolidation of external purchasing through methods such as preferred suppliers or group purchasing (Monczka, et al., 1993) and the consolidation of internal purchasing activities through e-procurement, ERPs or other means of process standardization and control (Smart, 2010). The indicators for infrastructure for consolidation are cross-docking which plays a role in consolidation without the use of inventory and the use of consolidation centers such as distribution centers or depots to consolidate material without integrating this consolidation with shipments. The second coding category identifies the types of consolidation networks; these are: dedicated consolidation (one point of departure to one point of arrival), multiplant to single point (multiple point of departures to one point of arrival) and multiplant to multiplant (multiple point of departures to multiple points of arrival) (Miemczyk & Holweg, 2004). This approach left out one indicator that came up in the literature and that is the option of inverse multiplant (one point of departure to multiple points of arrivals) which was subsequently added. The third coding category measures the number of organizations involved in the consolidation defined as a single organization or multiple organizations which includes the use of third party logistics companies.

To understand the potential incentives for and obstacles to consolidation, the propositions put forward by Cruijsen, Cools and Dullaert were used (Cruijsen, et al., 2007). Their research focused on a large scale survey investigating opportunities and impediments in horizontal cooperation for logistics services providers. Even though logistics service providers are not the sole focus of this study, the authors' findings through factor analysis offer a good start to understanding horizontal cooperation which is required to manage consolidation between organizations. Furthermore, logistics service providers often play the role of consolidators in supply chains as it is one of their main business activity. Indeed, consolidation is a common activity especially offered via third party logistics (Maltz, et al., 1993; Knemeyer & Murphy, 2004; Sohail, et al., 2006) where contracts and using incoterms (International Commercial Terms) offer clear definitions of activities to better manage cooperation issues. The categories of potential incentives drawn from Cruijsen et al. (2007) were: increased productivity of core logistics activities, reduced cost of non-core activities, reduction of purchasing cost, specialization and broadening of logistics services, better quality of logistics services at lower cost, use of large shippers for large contract and cost reduction and/or economies of scale. The categories of obstacles obtained from Cruijsen et al. (2007) were: 1) hard to find commensurable LSPs (logistic service providers) with whom it is possible to cooperate for (non-)core activities; 2) hard to find a reliable party that can coordinate the cooperation in such a way that all participants are satisfied; 3) when an LSP cooperates with commensurable companies, it becomes harder to distinguish itself; 4) it is hard for the partners to determine the benefits or operational savings due to horizontal cooperation beforehand; 5) partners find it hard to ensure a fair allocation of the workload in advance; 6) a fair allocation of benefits to all the partners is essential; 7) cooperation is greatly hampered by ICT-investments and, 8) when benefits cannot be shared in a perceived fair way, the larger players will always benefit most.

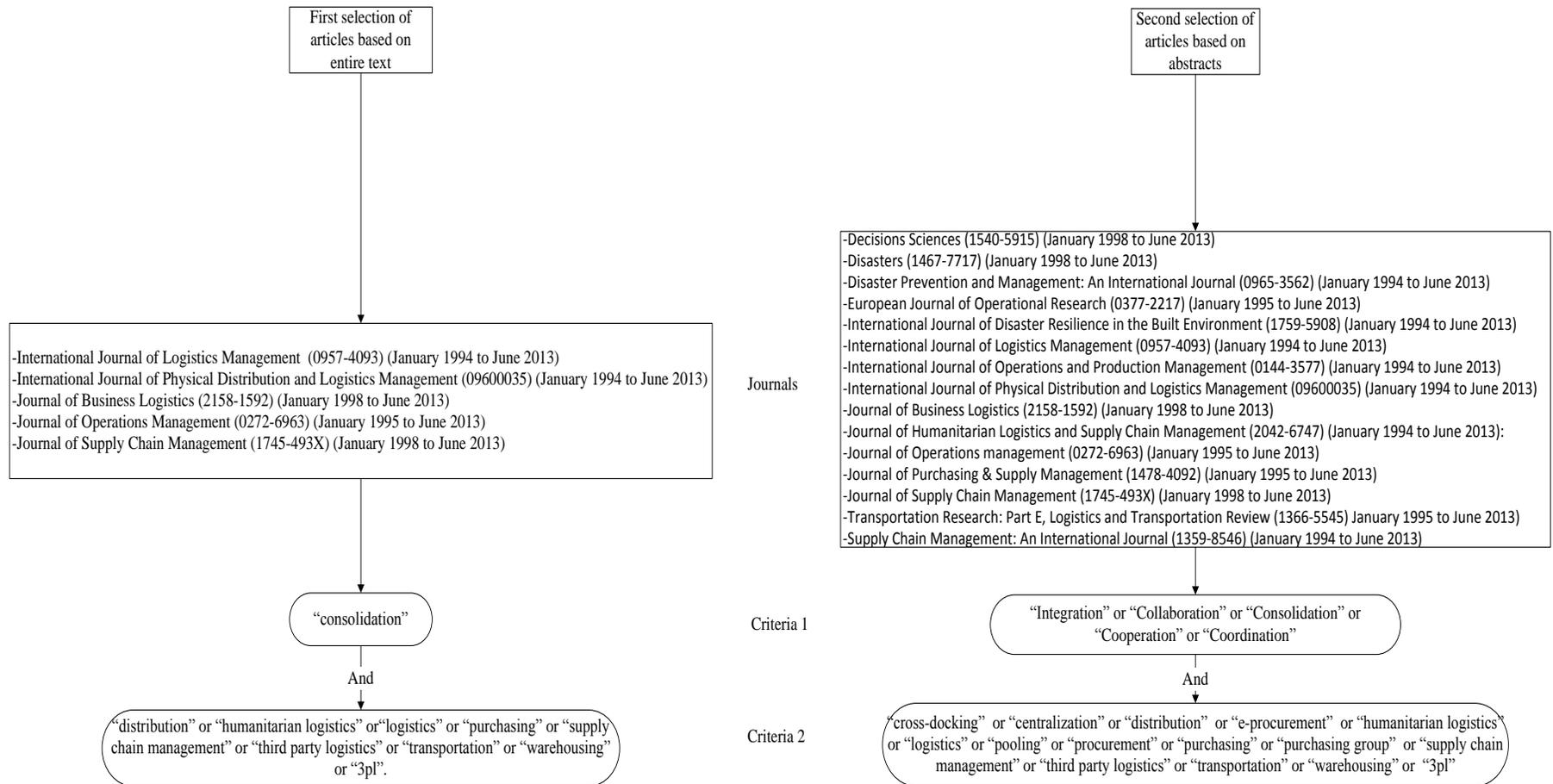
The coding scheme is based on a diverse literature that discusses consolidation; it develops categories which indicate through which resources consolidation is achieved and identify what are the potential incentives or obstacles. To these literature-based categories were added certain specific indicators that were identified while reviewing the first selection of articles expanding certain coding categories that were not previously included in the coding. This might be construed as grounded theory since the new coding indicators were "discovered" from the data and "Grounded theory is an inductive, theory methodology that allows the researcher to

develop a theoretical account of the general features of a topic (...)” (Martin & Turner, 1986) p 141. However, the methodological goal of this paper is not to combine qualitative data analysis with grounded theory since this erodes grounded theory research (Glaser & Holton, 2007). Indeed, as put forward by Suddaby (2006), grounded theory does not consist of only content analysis (Suddaby, 2006). The theory building exercise in this article uses theoretical concepts already developed in humanitarian logistics to orient theory development for material consolidation. With this in mind some indicators were added based on themes present in the literature. In the context of resources these new indicators included infrastructure such as consolidation centers and cross-docks. For the network, indicators on the number of organizations involved as well as inverse multiplant configurations were added. Finally, there were some fine-tuning made to the categories related to incentives and obstacles. Five other indicators of potential incentives for consolidation also come out from the literature and were added to the coding categories: cost reductions through economies of scale; the reduction of CO₂ gas emissions; increased speed of delivery; increased security of supply; and flexibility and responsiveness to change. Six other indicators of negative consequences also came out from the literature and were added to the coding category: an increase in delays; an increase in costs; reduced flexibility; a lack of information and uncertainty; conflicting missions and principles; and cultural differences.

After the first content analysis and addition to coding categories, there was an expansion of the selection criteria done in the light of multiple and broader descriptions of material consolidation in the literature; this was done with a second selection of articles that used both more journals and more terms used to describe consolidation (Figure 2). The additional journals were also identified as relevant periodicals for academics in the area of logistics and supply chain management (Gibson & Hanna, 2003; Menachof, et al., 2009) while journals known to publish on topics relevant to disasters were also added. This second search was done on the keywords and abstract field to ensure a better relevance to material consolidation. The exclusion of the material followed the same approach done in the first material retrieval with the additional step of removing duplicate articles which led to 37 new articles coded in detail for a total of 87 articles coded in the end.

Finally, to ensure reliability in content analysis the coding was done by two coders independently in parallel. When one coding indicator was added by a coder both coders would review all articles based on this new indicator. To further ensure reliability, the coding results were tested with Krippendorff's alpha coefficient. Krippendorff's Alpha coefficient offers a statistical measure of the extent of agreement among coders. After the final coding analysis, Krippendorff's alpha coefficient was 0.8316 with 95% inter-coder agreement slightly above the threshold put forward by Krippendorff (Krippendorff, 2004). To compute Krippendorff's Alpha coefficient, the SPSS macro version 1.1 provided by Andrew Hayes was used (Hayes, 2005).

Figure 2: Selection of articles.



Analysis of the literature:

The content-analysis led to interesting findings. The type of consolidation decision was rather varied with consolidation centers (51) the most discussed approach and purchasing consolidation, external (6) and internal (3), being the least discussed form of consolidation. The research in the articles centred mostly on describing consolidation that involves more than one firm (68) instead of consolidation for a single firm (11). Furthermore, the more common type of consolidation network is the multiplant to multiplant network (31). These results seem to indicate that the literature is particularly concerned with complex activities of consolidation that involve multiple organizations within large networks. Nevertheless, all the categories related to type of consolidation, the number of organizations involved and the type of network were present across the literature. These findings point to the different types of resources that are required to achieve consolidation: networks of business relationships between or within organizations (dedicated (12), multiplant (6), inverse multiplant (12) and multiplant to multiplant (31)), consolidation knowledge (pure dispatch consolidation (26), integrated inventory and outbound shipment consolidation (16), external (6) and internal (3) purchasing consolidation)) and infrastructure (cross docking hubs (51) and consolidation centers (21)) to manage the material itself. The four types of networks are relevant for any of the types of consolidation and as such they are related to all of the incentives and obstacles. The other resources required for consolidation are relevant to specific types of consolidation incentive and obstacles that sometimes overlap (figure 3).

Some organizations will integrate resources together to make decisions that often include both warehousing infrastructure and purchasing and transportation knowledge across their networks. Together these different resources create a specific competence for organizations to enable the consolidation of material goods. This competence can be understood as the management of the interrelation of physical resources, human resources, processes and knowledge to create a combination of resources that will support organizational competence and routines in the supply chain. In effect, they will be creating a network where different types of consolidation can take place depending on the resources available internally as well as the resources and materials of potential partners. Certain companies that do not have access to these resources will instead resort to outsourcing their material consolidation activities to third party logistics provider who specialize in this sort of activity. For the potential incentives and

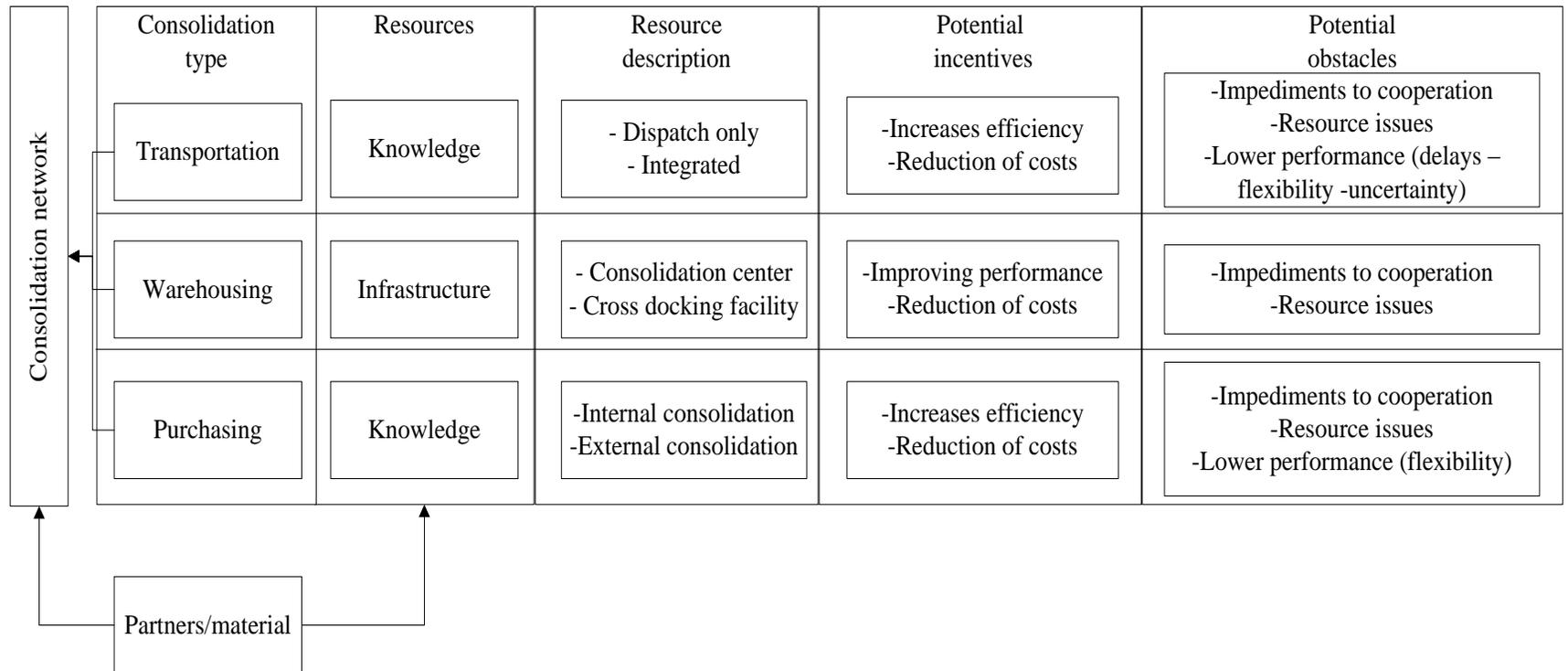
obstacles, the results of the coding show very clearly that consolidation in the private sector literature has both positive and negative impacts. However, the negative aspects are less emphasized in the literature since there was a total of 253 mentions of potential incentives discussed as opposed to 88 obstacles.

The potential incentives emphasize foremost the productivity (72) and cost reductions (78) with a reduction of non-core logistics costs (8) and purchasing costs (17). Productivity gains in the supply chain are thus one of the main reasons why companies seek out consolidation of goods. In terms of productivity, improvements in efficiency are present in the literature through cost reductions and performance increases while better customer service is also there in the form of increased speed of delivery (18), increased security of supply (12) and flexibility and responsiveness to change (27). It is interesting to note that there is a difference between the transportation and the warehouse and purchasing focused literatures for different incentives and obstacles. For instance, consolidation in warehousing often relates to centralization of warehouses in distribution centers and cross-docking activities. By consolidating materials in fewer physical locations, the total required safety stock across the network is reduced as risk is pooled to mitigate stock-out risks and the number of items shipped from each location in the network increases. This can end up increasing the responsiveness of transportation through improving the management of a few consolidated depots and guaranteeing a better service to customers. There is one indicator that stands out of these categories: the reduction of CO₂ gas emission. This indicator is quite important to mitigate the effects of global warming and can be achieved partly by transforming less than truck load shipments into full truck loads in transportation.

Consolidation for transportation and purchasing increases efficiency (productivity of core logistics activity, improving logistics services and using large contracts) while consolidation for transportation, warehousing and purchasing reduces a range of costs (through economies of scale, for non-core activities, for purchasing, or through better quality logistics service at lower costs). As logistics costs can be high for humanitarian organizations, this constitutes one argument for the importance for humanitarian organizations to address the issue of consolidation. Moreover warehouse consolidation not only improves productivity from better use of the facilities and helps reduce cost but it also offers the benefit of improving performance (through

flexibility, security of supply and speed of delivery). These performance improvements are all important when it comes to support the response to the needs of the beneficiaries and this would constitute another argument for the importance of consolidation. These arguments are reflected in three overarching incentives that came up from the literature review: costs reductions, increased efficiency and improved performance (figure 3). These findings are in part supported by humanitarian literature which identifies the role of coordination and collaboration as a way of reducing gaming (Bhattacharya, et al., 2014), improving cost performance (Battini, et al., 2014; Chandes & Paché, 2010) and reaching more beneficiaries (Moore, et al., 2003).

Figure 3: Consolidation type and links to resource, potential incentives and obstacles



For the obstacles, the most important comes from an increase in delays (26). This affects transportation since consolidation can be linked to the decision of dispatch which relies on time delays or on waiting for a shipment to fill up; delaying for consolidation can lead to issues of poor service for customers in the form of increased uncertainty in delivery times. This effect of withholding policies can also reduce flexibility in shipments (6) while purchasing consolidation also reduces flexibility of sourcing options. Transportation consolidation was also identified as creating a lack of information and uncertainty (10) and this can be related to the unknown delays created by withholding policies or by outsourcing consolidation activities to another company. Together these obstacles represent the lowering of performance during consolidation. Another issue that is interesting to bring up are the impediments to cooperation, even though individually each of Cruijssen et al.'s classification mentioned previously did not come up often in the literature but totalled 35 instances combined. Impediments to cooperation can affect all three types of consolidation and reduce the propensity of an organization to consolidate. Moreover, cooperation for consolidation is important and can constitute an impediment since poor cooperation can wipe out potential savings from consolidation.

One finding that was counter-intuitive for potential obstacles is the fact that consolidation can increase cost (10) as consolidation is often seen as a way to reduce cost. An increase in cost can be explained by the consolidation of multiple depots into a smaller number of depots which leads to an increase in distance traveled and the related transportation costs. Other explanations for this cost increase are standardizing resources in between partners to facilitate consolidation, implementing ERPs and increasing the frequency of shipments for transportation. As such cost increases could result from any type of consolidation. Another issue that might come up is the lack of resources to consolidate. Indeed, if there is no knowledge or infrastructure to consolidate materials, consolidation would be seriously impaired. The last potential obstacles are conflicting mission and principles and cultural differences which came up once but stood out as being in an article on humanitarian logistics. This implies that the conflicting mission and principles as well as their cultural differences of non-profit organization might create an impediment to cooperation and prevent them from consolidating their activities. **Impediments to cooperation are the main point that appears in humanitarian literature in relation to coordination. Coordinators need to be successfully matched so that resources complement themselves (Akthar, et al., 2012), trade-offs between inter and intra cluster addressed (Jahre & Jensen, 2010) and confusion in between the**

humanitarian organizations reduced (Stephenson Jr. & Schnitzer, 2006). Nevertheless, the review in the paper shows that the three overarching obstacles to consolidation are thus, impediments to cooperation, lower performance and resource related issues (table 1).

Table 1: Coding results: number of articles per indicator for each category

Category	Resource	Indicator	Count
Type of consolidation decision	Knowledge	Pure dispatch consolidation	26
	Knowledge	Integrated inventory and outbound shipment consolidation	16
	Knowledge	Purchasing external consolidation	6
	Knowledge	Purchasing internal consolidation	3
	Infrastructure	Cross-docking hub	21
	Infrastructure	Consolidation centers	51
Type of consolidation network	Network	Dedicated (1 to 1)	12
	Network	Multiplant (Multiple to 1)	6
	Network	Inverse Multiplant (1 to Multiple)	12
	Network	Multiplant to Multiplant (Multiple to Multiple)	31
Category	Indicator	Count	
Number of organizations involved	Inside a single firm	11	
	Multiple firms (including third party logistics)	68	
Potential incentives of consolidation	Increased productivity of core logistics activities	72	
	Reduced cost of non-core activities	8	
	Reduction of purchasing cost	17	
	Specialization and broadening of logistics services	7	
	Better quality of logistics services at lower cost	16	
	Use of large shippers for large contract	1	
	Cost reduction and/or economies of scale	78	
	Reduction of gas emission	8	
	Increased speed of delivery	18	
	Increased security of supply	12	
	Flexibility and responsiveness to change	16	
Potential obstacles to consolidation	Hard to find commensurable LSP s with whom it is possible to cooperate for (non-)core activities	1	
	Hard to find a reliable party that can coordinate the cooperation in such a way that all participants are satisfied	11	
	When an LSP cooperates with commensurable companies, it becomes harder to distinguish itself	1	
	It is hard for the partners to determine the benefits or operational savings due to horizontal cooperation beforehand	3	
	Partners find it hard to ensure a fair allocation of the workload in advance	1	
	A fair allocation of benefits to all the partners is essential	4	
	Cooperation is greatly hampered by ICT-investments	13	
	When benefits cannot be shared in a perceived fair way, the larger players will always benefit most	1	
	Consolidation can increase delays	26	
	Consolidation can cause increase in costs	10	
	Reduced flexibility	6	
	Lack of information/uncertainty	10	
	Conflicting mission and principles and cultural differences	1	

Discussion of a theoretical framework for consolidation in humanitarian logistics:

In a for-profit context, consolidation can be understood as a way to develop a competitive advantage with supply chains via cost reductions, productivity and increased efficiency while trying to avoid being affected by delays, increased costs, a lack of resources and issues with cooperation. Consolidation is made possible through the development, in a wide range of combination of network of relationships supported by infrastructure and knowledge of consolidation decisions (figure 3). These resources represent organizational decision making, activities and physical attributes that can be combined in multiple ways to create the competences to consolidate goods. In the case of humanitarian logistics, competition between organizations is largely focused on obtaining funding sources. However these sources can be leveraged through consolidation to procure and transport more goods and services to reach beneficiaries and increase the organisation's impact. This performance can then be used to increase their reputation with actual and future donors and secure more funds.

Even with the specific finding of the obstacle stemming from conflicting mission and principles and cultural differences, the very small number of articles addressing humanitarian logistics (2) prevents a comparison between commercial and humanitarian consolidation activities. However, to better understand the considerations related to consolidation of goods in humanitarian logistics it is possible to take an overview of the findings of the mostly commercial literature review and interpret them through the use of another framework derived from humanitarian logistics research. The framework for consolidation in this study is partially based on a conceptual model that identifies challenges for humanitarian logisticians developed by Kovács and Spens (Kovács & Spens, 2009). This model identifies different challenges faced in the context of the field research in Ghana: disaster types, the focus of organizations as well as the stakeholder environment. The theoretical framework in this discussion section (Figure 4) touches on these challenges but has additional dimensions to take into account the incentives and obstacles to consolidation identified in the content-analysis.

The disaster type context is characterized by the phases of a disaster, usually separated in preparedness, response and reconstruction (Beamon, 2004; Jahre & Height, 2008; Benini, et al., 2009) and the speed of the disaster, with fast onset and slow onset disaster (Van Wassenhove, 2006; Kovács & Spens, 2009). When disaster strikes, the most important factors in the response

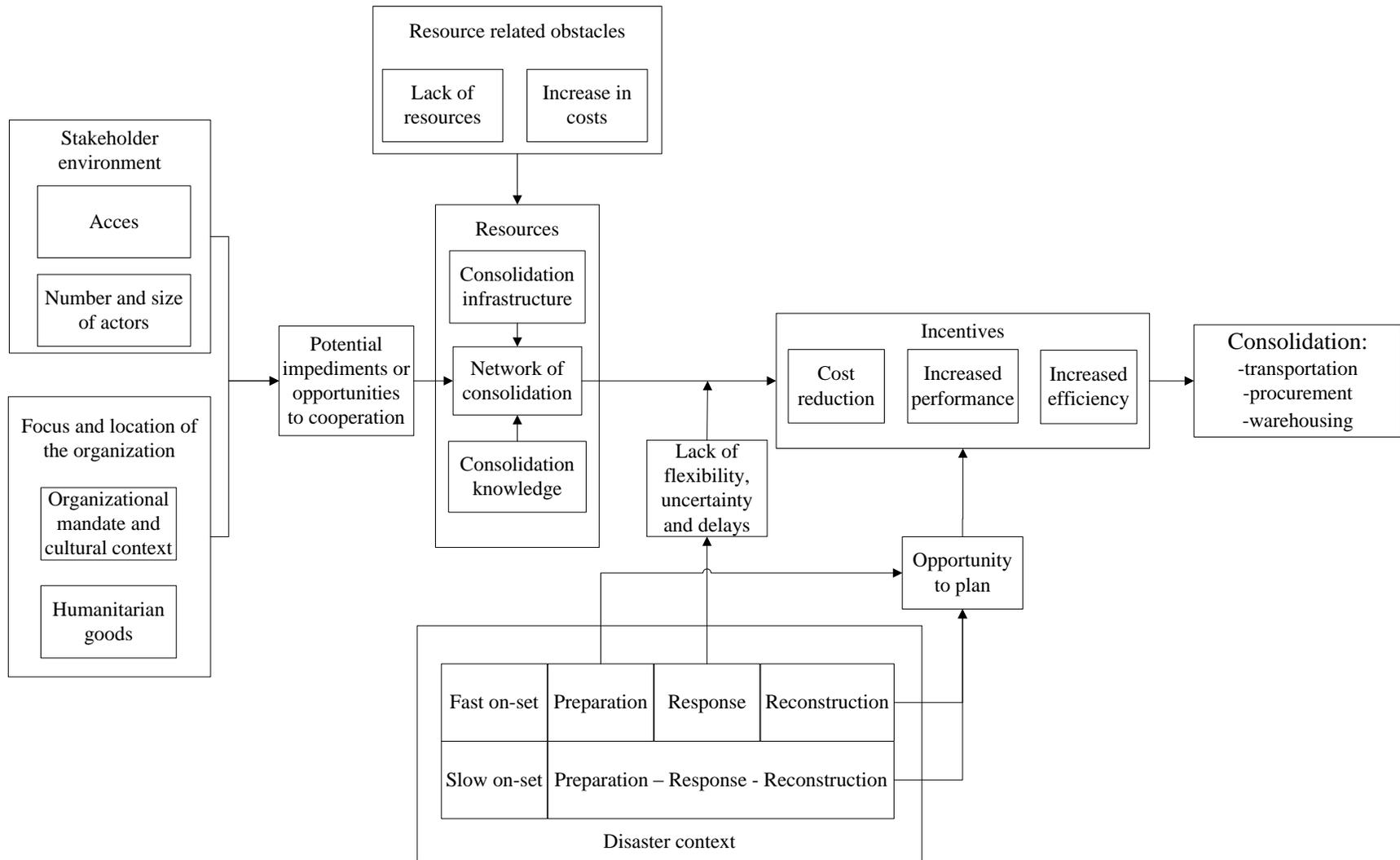
by humanitarian organizations is the time frame; indeed in certain disasters, the response time is critical to reach affected communities (Yi & Özsamar, 2007; Kovács & Spens, 2009). In the case of the response phase for a fast onset disaster, the risk of delays and loss of flexibility of transportation consolidation might create an obstacle to consolidation. Purchasing consolidation is not linked to delays however, a reduced number of suppliers can affect flexibility but in the context of a disaster, sourcing could be organized with local suppliers (Gustavsson, 2003). If local suppliers are overwhelmed by the disaster, humanitarian organizations will ship pre-purchased goods from their warehouses. Warehousing consolidation would be another option as they generate performance benefits although large consolidated warehouses are usually established prior to the response to a disaster (Schulz & Blecken, 2010). Sudden-onset disasters can also destroy or greatly destabilize the current infrastructure (Kovács & Spens, 2007) which would delay access by organizations to infrastructure such as warehouses required for consolidation. The disaster context will thus create obstacles to transportation and purchasing consolidation in situations where delays and lack of flexibility are unacceptable (figure 4).

The other disaster phases include preparedness and reconstruction. These phases as well as development activities in which humanitarian organizations engage in are planned in advance. The preparedness phase is well suited for consolidation when organizations are pre-positioning and keeping safety stock of goods. Indeed, the goods for multiple operations as well as of multiple organizations can be warehoused at the same site (Beresford & Pettit, 2009; Schulz & Blecken, 2010). Since there might be multiple warehouses for worldwide, regional and country levels disasters (Beresford & Pettit, 2009), each of these warehouses acts as consolidation infrastructure with the potential for multiple organizations to be involved with warehouse management (Ishii & Nose, 1996; Strack & Pochet, 2010; Hariga, 2011). The warehouses stocked with the goods of multiple organizations can also manage the consolidation of the procurement for these organizations (Schulz & Blecken, 2010; Balick, et al., 2010). These warehouses also play an additional role of consolidation through kitting by creating specific kits containing different types of items that respond to a specific type of need (Schulz & Blecken, 2010). Nevertheless, disasters that can be better predicted and have a slow-onset (droughts for instance) can be better prepared for in advance as well (Wilhite, 2002; Moe & Pairote, 2006; Kovács & Spens, 2009) and the response phase can be stretched out during the duration of the

disaster allowing for better planning. Disaster contexts where planning is possible are best suited to arrange organizational resources for consolidation.

Regardless of the disaster context, the focus and location of the organization may also affect the network available for consolidation either through the offer of resources or of material to consolidate. Organizational mandates play a role in preventing cooperation as it could be defined for a specific disaster phase or type; often organizations receive funding for short-term disaster relief (Gustavsson, 2003). The political or apolitical characteristics of an organization can determine how much it can work with other organizations to consolidate goods (Pettit & Beresford, 2005). Cultural issues might also lead to differences in needs and preferences for types of goods as well as create language issues which will impair adequate distribution (Long & Wood, 1995) and potential for consolidation. The type of goods is also an issue, often one type of goods cannot be mixed with another (water treatment and food for example) while other goods require special handling such as cold chain facilities for vaccines for example). Another problem that affects cooperation is the lack of standards (Murray, 2005). As non-standard documentation and handling material is not easily transferable in between organizations, this increases the cost and reduces the possibility of cooperating.

Figure 4: Framework for consolidation in humanitarian logistics.



Additionally, the stakeholder environment affects consolidation depending on the number of organizations operating in an area and their size. On one hand, consolidation with a larger number of organisations or a large organisation is complex and time consuming which can increase the cost of consolidation. In this case the number of actors would act as an impediment to cooperation. On the other hand, consolidation more easily generate gains with the presence of multiple partners. These partners offer the possibility to increase the amount of material handled and achieve consolidation of volume and they can also share their resources increasing the possibilities to achieve consolidation. Access to an area is also important. The costs related to reaching areas in need of assistance and the capacity of organizations can play a role with certain organizations not having the financial, human or material resources to operate in certain regions. Access to areas in need might also be limited because of the presence of security issues. These security issues can create an impediment to cooperation with only certain organisation being given access or with the belligerent forces trying to control the flow of aid. However, aid organization can use security disruptions that prevent deployments to plan for improved cooperation and consolidation activities while waiting for the security situation to improve (Tomasini, 2012; Beamon & Kotleba, 2006).

Together the focus and location of the organization and the stakeholder environment can create potential impediments or opportunities to cooperate for organizations and thus affect the network of resources available for consolidation, the number of potential participants as well as the amount of material. The focus of organizations combined with the multitude of stakeholders can make it hard to identify with whom to cooperate or who should coordinate the cooperation and what type of benefits are possible without creating a lack of information and uncertainty during consolidation. The satisfaction of all parties (by being fair with allocating benefits and workloads) is also hard to achieve to maintain cooperation. Moreover, smaller organizations might not want to associate with larger organizations as this might make it harder for them to distinguish themselves or they might receive fewer benefits than larger organisations from cooperating.

Conclusion and further research:

This study develops a theoretical framework to better understand incentives and obstacles to consolidation of materials in humanitarian logistics. Through the combination of a literature

review and discussion based on previous frameworks related to humanitarian logistics, the framework highlights the role of resources as well as the contextual challenges of humanitarian logistics in relation to potential incentives and obstacles. The elaboration of this framework ties into the overall theoretical framework put forward by Jahre et al. (2009) and contributes a relevant framework specifically for consolidation that consists of centralized coordination. The framework can also be understood through the factors influencing supply chain design put forward by Melnyk et al. (2014). Indeed, the stakeholder environment, focus and location of the organization as well as disaster context are broad environmental influencers of the supply chain. Design decisions represent how an organisation organizes its resources to achieve a network for material consolidation while infrastructure and knowledge are required to address the resource related obstacles through specific investments. The concepts and their relationships put forward in this framework are supported by a thorough literature review and create further avenues of inquiry to address the lack of literature on consolidation in humanitarian logistics as an emerging area of study for humanitarian logistics. The framework presented in this paper offers an interesting base to test consolidation in the field and for specific operations; some aspects of consolidation are already discussed through coordination, collaboration and cooperation literature but a specific focus on material flow management is still lacking. The incentives and obstacles and their links should be further tested with field research to improve the framework and help build a complete portrait of potential consolidation options to maximize the benefits of humanitarian organizations in improving efficiency whether deploying for disasters, conflicts or development activities. The conceptual nature of this paper brings certain limitations to the development of a theoretical framework, the most glaring one being the lack of empirical support for the findings. Another limitation is the use of other frameworks for the purpose of coding; even though the coding grid was modified to take into account the findings in the literature to offer a more complete picture, there might still be shortcomings in the coding scheme used.

In light of the important incentives to save costs through economies of scale and the lack of literature covering the subject this study presents different considerations for consolidation by humanitarian organizations in the form of a framework. Consolidation of activities would offer organizations the possibility to reduce their high logistics cost and procure more materials for the beneficiaries in need. Control of costs and the logistics performance is relevant for humanitarian organizations when considering that most funding appeals by the UN are usually unmet; in 2013

around 19 consolidated funding appeals for humanitarian operations were submitted through OCHA (Office for the Coordination of Humanitarian Affairs) were funded at best at 77% and at worst 21% (Smith & Swithern, 2014). Furthermore, the framework puts forward a summary list of resources that might be required as a basic requirement to be able to achieve consolidation. This can help logisticians in humanitarian organization evaluate if they have the potential to be able to consolidate materials inside their supply chains or with other supply chain members. A lack of certain resources or capability in resolving obstacles could push the logistics group to work with other organizations to resolve this internal capacity issues. A good example of this would be to join simple purchasing services to benefit from some of the economies of scale available through consolidation such as the UNICEF Procurement Services (UNICEF, 2014). Moreover, the obstacles to consolidation highlighted in this study also can help logisticians in organizations to reflect on potential solutions in advance to facilitate consolidation inside and in between organizations for both development and emergencies. One such example are kits which are prepared in advance. A good example of this type of kitting activity is the inter-agency-health-kit (World Health Organization, 2014). Alternatively they could work with organizations with bigger logistics capacity such as the World Food Program (WFP) which organized a worldwide network of shared warehouses called the United Nations Humanitarian Response Depot that coordinates a wide range of services for procurement and warehousing (UNHRD) (WFP, 2014). Consolidation activities are also sometimes put in place through logistics clusters. The cluster approach has been put forward by OCHA in 2005 and aims to increase coordination (United Nations Office for the Coordination of Humanitarian Affairs, 2014) between UN and non –UN agencies in the humanitarian sector. Different options are available to support consolidation but logisticians must be able to understand what the potential sources of obstacles are to choose the right approach to consolidation and benefit from it. These different activities put forward by humanitarian organizations also offer potential empirical avenues for further research based on this framework.

Bibliography

- Akthar, P., Marr, N. & Garnevska, E., 2012. Coordination in humanitarian relief chains: chain coordinators. *Journal of Humanitarian Logistics and Supply Chain Management*, 2(1), pp. 85-103.
- Altay, N., 2008. Issues in disaster relief logistics. In: M. Gad-el-Hak, ed. *Large-Scale Disasters: Prediction, Control and Mitigation*. New York: Cambridge University Press, pp. 120-146.
- Altay, N. & Pal, R., 2014. Information Diffusion among Agents: Implications for Humanitarian Operations. *Production and Operations Management*, 23(6), p. 1015–1027.
- Balcik, B. & Beamon, B. M., 2008. Facility location in humanitarian relief. *International Journal of Logistics*, 11(2), pp. 101-121.
- Balick, B. et al., 2010. Coordination in humanitarian relief chains: Practices, challenges and opportunities. *International Journal of Production Economics*, 126(1), pp. 22-34.
- Battini, D., Peretti, U., Persona, A. & Sgarbossa, F., 2014. Application of humanitarian last mile distribution model. *Journal of Humanitarian Logistics and Supply Chain Management*, 4(1), pp. 95-130.
- Beamon, B. M., 2004. *Humanitarian Relief Chains: Issues and Challenges*. San Francisco, 34th International Conference on Computers and Industrial Engineering.
- Beamon, B. M. & Kotleba, S. A., 2006. Inventory management support systems for emergency humanitarian relief operations in South Sudan. *The International Journal of Logistics Management*, 17(2), pp. 187-212.
- Benini, A., Conley, C., Dittermore, B. & Waksman, Z., 2009. Survivor needs or logistical convenience? Factors shaping decisions to deliver relief to earthquake affected communities, Pakistan 2005-06. *Disasters*, Volume 33, pp. 110-131.
- Beresford, A. & Pettit, S., 2009. Critical Success Factors in the Context of Humanitarian Aid Supply Chains. *International Journal of Physical Distribution & Logistics Management*, 39(6), pp. 450-468.
- Bhattacharya, S., Hasija, S. & Van Wassenhove, L. N., 2014. Designing Efficient Infrastructural Investment and Asset Transfer Mechanisms in Humanitarian Supply Chains. *Production and Operations Management*, 23(9), p. 1511–1521.
- Brauner, M. K. & Gebman, J. R., 1993. Is Consolidation Being Overemphasized for Military Logistics. *RAND Issue Paper*, pp. 1-8.

- Çetinkaya, S., 2005. Coordination of Inventory and Shipment Consolidation Decisions: A Review of Premises, Models, and Justification. In: J. Geunes, et al. eds. *Applications of Supply Chain Management and E-Commerce Research*. s.l.:Springer US, pp. pp 3-51.
- Çetinkaya, S. & Bookbinder, J. H., 2003. Stochastic models for the dispatch of consolidated shipments. *Transportation Research Part B*, Volume 37, p. 747–768.
- Chandes, J. & Paché, G., 2010. Investigating humanitarian logistics issues: from operations management to strategic management. *Journal of Manufacturing Technology Management*, 21(3), pp. 320-340.
- Cooper, M., 1984. Cost and Delivery Time Implications of Freight Consolidation and Warehousing Strategies. *International Journal of Physical Distribution & Logistics Management*, 14(6), pp. 47-67.
- Crujissen, F., Cools, M. & Dullaert, W., 2007. Horizontal Cooperation in Logistics: Opportunities and Impediments. *Transportation Research Part E*, Volume 43, pp. 129-142.
- Cullinane, K. & Toy, N., 2000. Identifying influential attributes in freight route/mode choice decisions: a content analysis. *Transportation Research Part E: Logistics and Transportation Review*, Volume 36, pp. 41-53.
- Davenport, T. H., Harris, J. G. & Cantrell, S., 2004. Enterprise systems and ongoing process change. *Business Process Management Journal*, 10(1), pp. 16-26.
- Dolinskaya, I. S., Shi, Z. E., Smilowitz, K. R. & Ross, M., 2011. Decentralized Approaches to Logistics Coordination in Humanitarian Relief. Reno, *Industrial Engineering Research Conference*.
- Ertem, M. E., Buyurgan, N. & Rossetti, M. D., 2010. Multiple-buyer procurement auctions framework for humanitarian supply chain management. *International Journal of Physical Distribution & Logistics Management*, 40(3), pp. 202-227.
- Fein, A. J. & Jap, S. D., 1999. Manage Consolidation in the Distribution Channel. *Sloan Management Review*, 41(1), pp. 61-72.
- Feng, C., Fan, G., Zhang, Y. & Yang, T., 2010. Collaboration in Humanitarian Logistics. Reston, *ICLEM 2010: Logistics for Sustained Economic Development*.
- Gibson, B. J. & Hanna, J. B., 2003. Periodical Usefulness: The U.S. Logistics Educator Perspective. *Journal of Business Logistics*, 24(1), pp. 221-240.
- Glaser, G. B. & Holton, J., 2007. Remodeling Grounded Theory. *Historical Social Research / Historische Sozialforschung*. Supplement, Volume Supplement, No. 19, pp. 47-68.

- Gray, A. E., Karmakar, U. S. & Seidmann, A., 1992. Design and operation of an order consolidation warehouse: Models and application. *European Journal of Operational Research*, Volume 58, pp. 14-36.
- Grosswiele, L., Röglinger, M. & Friedl, B., 2013. A decision framework for the consolidation of performance measurement systems. *Decision Support Systems*, Volume 54, pp. 1016-1029.
- Gunasekaran, A. & Ngai, E. W., 2005. Build-to-order supply chain management: a literature review and framework for development. *Journal of Operations Management*, 23(5), pp. 423-451.
- Gustavsson, L., 2003. Humanitarian logistics: context and challenges. *Forced Migration*, Volume 18, pp. 6-8.
- Hariga, M. A., 2011. Inventory models for multi-warehouse systems under fixed and flexible space leasing contracts. *Computers & Industrial Engineering*, Volume 61, p. 744–751.
- Hayes, A. F., 2005. An SPSS procedure for computing Krippendorff's alpha [Computer software].. [Online]
Available at: <http://www.comm.ohio-state.edu/ahayes/macros.htm>.
[Accessed 05 03 2014].
- Ishii, H. & Nose, T., 1996. Perishable inventory control with two types of customers and different selling prices under the warehouse capacity constraint. *International Journal of Production Economics*, Volume 44, pp. 167-176.
- Jahre, M. & Height, I., 2008. Does the Current Constraints in Funding Promote Failure in Humanitarian Supply Chains. *Supply Chain Forum: An International Journal*, 9(2), pp. 44-54.
- Jahre, M. & Jensen, L.-M., 2010. Coordination in humanitarian logistics through clusters. *International Journal of Physical Distribution & Logistics Management*, 40(8/9), pp. 657-674.
- Jahre, M., Jensen, L.-M. & Listou, T., 2009. Theory development in humanitarian logistics: a framework and three cases. *Management Research News*, 32(11), pp. 1008-1023.
- Knemeyer, M. A. & Murphy, P. R., 2004. Evaluating the Performance of Third-Party Logistics Arrangements: A Relationship Marketing Perspective. *Journal of Supply Chain Management*, pp. 35-51.
- Kovács, G. & Spens, K., 2009. Identifying challenges in humanitarian logistics. *International Journal of Physical Distribution & Logistics Management*, 39(6), pp. 506-528.
- Kovács, G. & Spens, K. M., 2007. Humanitarian logistics in disaster relief operations. *International Journal of Physical Distribution & Logistics Management*, 37(2), pp. 99-114.

- Krippendorff, K., 2004. Reliability in Content Analysis: Some Common Misconceptions and Recommendations. *Human Communication Research*, 30(3), pp. 411-433.
- Long, D. C. & Wood, D. F., 1995. The logistics of famine relief. *Journal of Business Logistics*, 16(1), pp. 213-219.
- Mahato, S., Jain, A. & Balasubramanian, V., 2006. Enterprise Systems Consolidation. *Information Systems Management*, 23(4), pp. 7-19.
- Maltz, A., Riley, L. & Boberg, K., 1993. Purchasing Logistics Services in a Transborder Situation: Logistics Outsourcing in US-Mexico Co-production. *International Journal of Physical Distribution & Logistics Management*, 23(8), pp. 46-54.
- Manuj, I. & Mentzer, J. T., 2008. Global Supply Chain Risk Management. *Journal of Business Logistics*, 29(1), pp. 133-155.
- Martin, P. Y. & Turner, B. A., 1986. Grounded Theory and Organizational Research. *The Journal of Applied Behavioral Science*, 22(2), pp. 141-157.
- Mayring, P., 2008. *Qualitative Inhaltsanalyse – Grundlagen und. Weinheim: Beltz Verlag.*
- Melnyk, S. A., Narasimhan, R. & DeCampos, H. A., 2014. Supply chain design: issues, challenges, frameworks and solutions. *International Journal of Production Research*, 52(7), pp. 1887-1896.
- Menachof, D. A., Gibson, B. J., Hanna, J. B. & Anthony, W. E., 2009. An Analysis of the Value of Supply Chain Management Periodicals. *International Journal of Physical Distribution & Logistics Management*, 39(2), pp. 145-166.
- Meredith, J., 1993. Theory Building through Conceptual Methods. *International Journal of Operations & Production Management*, 13(5), pp. 3-11.
- Miemczyk, J. & Holweg, M., 2004. Building Cars to Customer Order - What Does it Mean for Inbound Logistics Operations. *Journal of Business Logistics*, 25(2), pp. 171-197.
- Moe, T. L. & Pairote, P., 2006. An integrated approach to natural disaster management: Public project management and its critical success factors. *Disaster Prevention and Management*, 15(3), pp. 396-413.
- Monczka, R. M., Trent, R. J. & Callahari, T. J., 1993. Supply Base Strategies to Maximize Supplier Performance. *International Journal of Physical Distribution & Logistics Management*, 23(4), pp. 42-54.

Moore, S., Eng, E. & Daniel, M., 2003. International NGOs and the Role of Network Centrality in Humanitarian Aid Operations: A Case Study of Coordination During the 2000 Mozambique Floods. *Disasters*, 27(4), pp. 305-318.

Murray, S., 2005. How to deliver on the promises: supply chain logistics: humanitarian agencies are learning lessons from business in bringing essential supplies to regions hit by the tsunami. *Financial Times*, 7 January, p. 9.

Overstreet, R. E., Hall, D., Hanne, J. B. & Rainer, K. R. J., 2011. Research in humanitarian logistics. *Journal of Humanitarian Logistics and Supply Chain Management*, 1(2), pp. 114-131.

Peck, H., 2005. Drivers of supply chain vulnerability: an integrated framework. *International Journal of Physical Distribution & Logistics Management*, 35(4), pp. 210-232.

Pettit, S. J. & Beresford, A. K. C., 2005. Emergency relief logistics: an evaluation of military, non-military and composite response models. *International Journal of Logistics Research and Applications*, 8(4), pp. 313-331.

Rouwenhorst, B. et al., 2000. Warehouse design and control: Framework and literature review. *European Journal of Operational Research*, Volume 122, pp. 515-533.

Schulz, S. & Blecken, A., 2010. Horizontal cooperation in disaster relief logistics: benefits and impediments. *International Journal of Physical Distribution & Logistics Management*, 40(8/9), pp. 636-656.

Seuring, S. & Gold, S., 2012. Conducting content-analysis based literature reviews in supply chain management. *Supply Chain Management*, 17(5), pp. 544-555.

Smart, A., 2010. Exploring the business case for e-procurement. *International Journal of Physical Distribution & Logistics Management*, 40(3), pp. 181-201.

Smith, K. & Swithern, S., 2014. The 2014 UN appeal Different process, greater needs, UK: Global Humanitarian Assistance.

Sohail, S. M., Bhatnagar, R. & Sohal, A. S., 2006. A comparative study on the use of third party logistics services by Singaporean and Malaysian firms. *International Journal of Physical Distribution & Logistics Management*, 36(9), pp. 690-701.

Stank, T. P. & Goldsby, T. J., 2000. A framework for transportation decision making in an integrated supply chain. *Supply Chain Management: An International Journal*, 5(2), pp. 71-78.

Stephenson Jr., M. & Schnitzer, M. H., 2006. Interorganizational Trust, Boundary Spanning, and Humanitarian Relief Coordination. *Nonprofit Management & Leadership*, 17(2), pp. 211-233.

Strack, G. & Pochet, Y., 2010. An integrated model for warehouse and inventory planning. *European Journal of Operational Research*, Volume 204, p. 35–50.

Suddaby, R., 2006. From the Editors: What Grounded Theory is Not. *Academy of Management Journal*, 49(4), pp. 633-642.

Tomasini, R. M., 2012. Humanitarian Partnerships - Drivers, Facilitators, and Components: The case of Non-Food Item Distribution in Sudan. In: G. Kovacs & K. Spens, eds. *Relief Supply Chain Management for Disasters Humanitarian Aid and Emergency Logistics*. Hershey: Business Science Reference, pp. 16-30.

Trent, R. J. & Monczka, R. M., 1998. Purchasing and Supply Management: Trends and Changes Throughout the 1990s. *International Journal of Purchasing and Materials Management*, pp. 2-11.

Trent, R. J. & Monczka, R. M., 1998. Purchasing and Supply Management: Trends and Changes Throughout the 1990s. *International Journal of Purchasing and Materials Management*, 34(3), pp. 2-11.

Trunick, P. A., 2005. Special Report: Delivering Relief to Tsunami Victims. *Logistics Today*, 46(2), pp. 1-3.

UNICEF, 2014. Procurement Services. [Online]
Available at: http://www.unicef.org/supply/index_procurement_services.html
[Accessed 17 09 2014].

United Nations Office for the Coordination of Humanitarian Affairs, 2014. Cluster Coordination. [Online]
Available at: <http://www.unocha.org/what-we-do/coordination-tools/cluster-coordination>
[Accessed 17 09 2014].

Van Wassenhove, L. N., 2006. Humanitarian aid logistics: supply chain management in high gear. *Journal of the Operational Research Society*, Volume 57, pp. 475-489.

Wacker, J. G., 1998. A definition of theory: research guidelines for different theory-building research methods in operations management. *Journal of Operations Management*, Volume 16, pp. 361-385.

Wanke, P. F. & Saliby, E., 2009. Consolidation effects: Whether and how inventories should be pooled. *Transportation Research Part E*, Volume 45, p. 678–692.

WFP, 2014. UNHRD Humanitarian Response Depots. [Online]
Available at: <http://www.unhrd.org/>
[Accessed 17 09 2014].

Whiting, M. C. & Ayala-Ostrom, B. E., 2009. Advocacy to promote logistics in humanitarian aid. *Management Research News*, 32(11), pp. 1081-1089.

Wilhite, D. A., 2002. Disaster Prevention and Management. *Natural Resources Forum*, Volume 26, pp. 275-285.

World Health Organization, 2014. The Interagency Emergency Health Kit 2011. [Online] Available at: <http://www.who.int/medicines/publications/emergencyhealthkit2011/en/> [Accessed 17 09 2014].

Wu, Y.-C. J. & Chou, Y. H., 2007. A new look at logistics business performance: intellectual capital perspective. *The International Journal of Logistics Management*, 18(1), pp. 41-63.

Yan, J. C., Wang, F.-K. & Du, T. C., 2003. An evaluation of freight consolidation policies in global third party logistics. *Omega*, Volume 31, pp. 55-62.

Yi, W. & Özsamar, L., 2007. A dynamic logistics coordination model for evacuation and support in disaster response activities. *European Journal of Operational Research*, Volume 179, p. 1177–1193.

Zyl, F. V., 1992. Freight Transport in a Changing Environment: Implementation of Deregulation. *International Journal of Physical Distribution and Logistics Management*, 22(2), pp. 33-39.