Mitigating Inefficiencies in Humanitarian Supply Chains

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Abstract

As disaster response becomes more complex, entities involved in humanitarian operations also increase in numbers and sophistication. Humanitarian actors are beginning to see the value that an efficient supply chain can bring. However, participating actors are faced with competition for funding and often do not cooperate with each other, which produces inefficient outcomes at the expenses of the beneficiaries. This paper explores the general concepts of a humanitarian supply chain, its actors and interactions, and reveal how competitive behaviours produce inefficiencies. The paper will present a case study that illustrates the inefficiencies in a humanitarian supply chain, by using system dynamics. Finally, the paper will explore various mitigation strategies by using incentives to reduce the inefficiencies, and conclude with some avenues for further research.

Keywords
Operations Management, Humanitarian, Supply Chain Management, Incentives, Competition

1. Introduction
Non-Governmental Organisations (NGOs) often compete for donations, as donors tend to be more sympathetic towards sudden emergencies rather than long-term aid and development, which may lead to a wide divergence of funding (Bookstein, 2003; Munslow, 1999). Donors are also becoming more demanding on performance and impact, and less tolerable of expensive duplication of effort, which fosters competition between the Humanitarian Relief Organisations (HROs) as they endeavour to solicit the funding. Thus, donors are encouraging HROs to collaborate with each other (A. Thomas & Kopczak, 2005). For example, the 2004 Asian Tsunami disaster revealed assistance from over 40 countries and 700 NGOs, including large agencies such as the World Health Organisation, the International Federation of the Red Cross and Crescent Societies and the United Nations Children's Fund (Chia, 2007; WHO, 2013). In Haiti, even before the 2010 earthquake, there were already 8000-9000 NGOs operating in the region (Rodgers, 2013). The earthquake caused an influx of HROs, such as Action Aid, Age UK, the British Red Cross, Oxfam, Save the Children, and World Vision (DEC, 2012).

The presence of numerous humanitarian actors can lead to unnecessary competition at a horizontal level between the downstream actors in the Humanitarian Supply Chain (HSC). Thus, calling for a need to explore how competition between the humanitarian actors affects the efficiencies and outcomes to the beneficiaries and exploring the benefits of cooperation between the humanitarian actors. Due to the influence on funding, there are implications on the donors and HROs on how they orchestrate their funding and relief assistance to downstream actors.

This paper is part of an on-going study that seeks to explore incentive mechanisms for efficient outcomes in the HSC. This paper will cover a literature review, an elaboration on key issues regarding competition in the HSC, explore incentives as a mechanism to mitigate competition and illustrate a case study to support the benefits of cooperation between actors in the HSC.

2. Literature Review

2.1 HSC and Humanitarian Actors
The uncertainty and unpredictability of natural disasters can destroy infrastructure, cripple communications and may leave an entire society in rubble. Since 2010, numerous sudden natural disasters have occurred, such as the Haiti earthquake (January, 2010), Chile an earthquake (February, 2010), earthquake and Tsunami in Japan (March, 2011),

floods in Thailand (July – December, 2011 and January, 2012) and a typhoon in the Philippines (December, 2012), just to name a few. In such circumstances, various actors are required to coordinate between and within each other to ensure that supplies arrive to the beneficiaries.

"*Typically, no single actor has sufficient resources to respond effectively to a major disaster"* (Bui, Cho, Sankaran, & Sovereign, 2000).

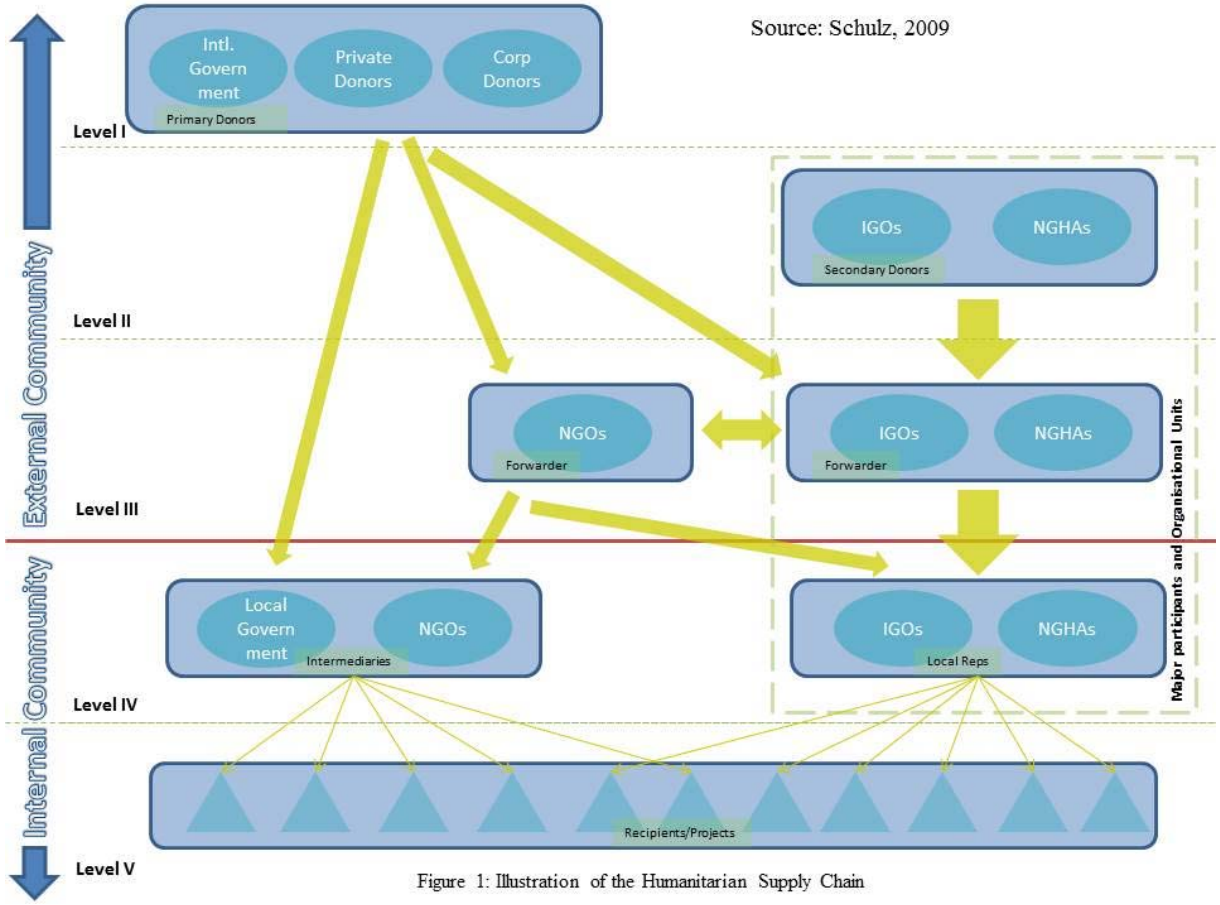


Figure 1: Illustration of the Humanitarian Supply Chain

An HSC typically comprises external donor countries, private donors or donor organisations providing funds or in-kind donations to International NGOs (INGOs) and NGOs utilise Third-Party Logistics service providers (3PLs) to facilitate the required needs to beneficiaries via local governments or NGOs (A. Thomas & Kopczak, 2005). Figure 1 reveals how the various actors in the HSC interact with each other and who the upstream and downstream actors are.

Approaching relief operations from a supply chain perspective is not new to the literature (A. Thomas & Kopczak, 2005), however, the extent is limited to tools that would help actors coordinate with each other. There is an avenue to research the use of appropriate incentives to address the competition between actors in the HSC.

2.2 Incentives

Despite the good intentions of the actors involved, coordination efforts may not be particularly successful for a variety of reasons, including the urgency to meet all the basic needs of the affected groups at the same time, ineffective utilisation of resources, political constraints on strategies and supplies, and incongruent goals (Kjellman, Harpviken, Millard, & Strand, 2003, p. 856). Furthermore, competition for media attention, funding levels and timing, and the intensity of the crisis can influence the ability and willingness of actors to cooperate across organisational lines (A. Thomas & Kopczak, 2005). Understanding incentives has been identified as a key variable in any thinking about the motivation, behaviour and capacity institutional interactions (Herbert, 2013).

Incentives are a tool for upstream actors to mitigate the competition and even foster cooperation between the downstream actors. The role of incentives in this paper is to explore shaping certain behaviours to achieve allocative efficiency amongst the actors. The essence of allocative efficiency in an HSC is that the 'price' that donors are willing to pay (i.e. funds), is reflective of the marginal utility they receive from providing funds. Optimal allocative efficiency is achieved when the services provided by the NGOs (or downsteam actors) is equal to the marginal utility of the donors. Also, it has been argued that, because of the separation between ownership and control of entities, front-end and back-end staff of an actor may have conflicting motives (Hart, 1983). Utilising proper incentives can influence downstream actors, so as to move toward allocative efficiency. Although not limited to, this type of efficiency can reduce welfare loss (Leibenstein, 1966). Thus, donors and upstream HROs can utilise funding to create incentives that would foster greater cooperation and facilitate improved outcomes for the beneficiaries.

3. Framework of Study

Humanitarian assistance often involves multiple organisations composed of different characters ranging from the United Nations Agencies (UNA) and INGOs through to the affected governments and indigenous NGOs, which encompasses the presence of hundreds of relief agencies, creating a problem for inter-agency coordination (Minear, 2002, pp. 29-31; Stephenson Jr, 2005, p. 338). HROs rely on donations for their activities and even compete with the UNAs for resources (Rey, 2001, p. 105; Stephenson Jr, 2005, p. 337). Furthermore, there is a sense of reluctance for information transparency amongst the HROs, as it may be an avenue to compete for funding (Minear, 2002, pp. 25-26; Stephenson Jr, 2005, pp. 337-338). Participating organisations tend to compare their coordination costs with the perceived benefits of being neutral or independent from each other (Minear, 2002; Stephenson Jr, 2005, p. 338).

Three key themes explored in this paper are:

- Competition between humanitarian actors at a horizontal level;
- Commercial actors practising opportunistic behaviour (e.g. increasing service delivery costs unnecessarily) and;
- Beneficiaries practising opportunistic behaviour (e.g. being selective with the oversupply of relief items).

As the actors in Level IV (Figure 1) rely on donations for their activities, there exists competition amongst organisations (including International Governmental (IGOs) and INGOs) for resources (Rey, 2001, p. 105; Stephenson Jr, 2005, p. 337). Furthermore, media attention may influence the amount of funding and may lead to an increase in the number of involved HROs (Stephenson Jr, 2005). This level of competition can lead to a duplication of services (Anisya Thomas & Kopczak, 2007) such as multiple warehousing services overlapping in the same region or an oversupply of a particular relief item.

The second key theme is the opportunistic behaviour that commercial 3PLs are taking advantage of. Resource scarcity creates an avenue for commercial companies to increase service delivery cost, as they may be able to monopolise the market. For example, there were major pricing structure disparities between the service providers for air cargo shipments to Haiti during the 2010 earthquake (Bajaj & Meier, 2010). In the case of an HSC, a 3PL service provider in Level IV (Figure 1) may preposition supplies in various warehouses in disaster free areas that are still within 'arms-length' distances to regions that are prone to disasters. When a sudden on-set disaster occurs, the 3PL may behave opportunistically by bidding their prices higher than the market level, as they are able to meet capacity in the immediate wake of the disaster.

This creates unwanted price (or costs) shocks to the NGOs (or implementing agencies) that would have to be justified to donors. Furthermore, these 'opportunistic 3PLs' will behave competitively between each other (see Figure 2) to preposition stocks and may even compete with the NGOs that have logistics capabilities.

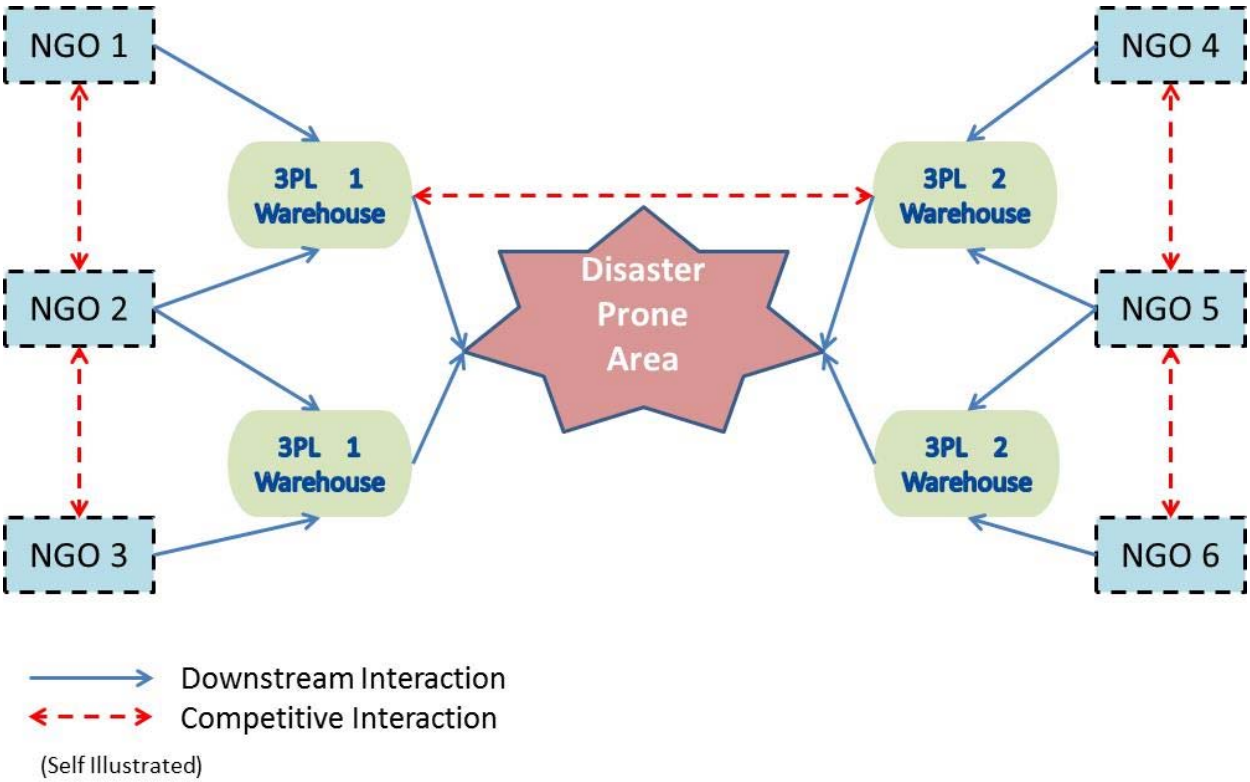


Figure 2: Illustration of Downstream and Competitive Interactions

Lastly, there is often a mismatch of demand and supply in the HSC (Oloruntoba & Gray, 2006). Needs assessments are often done independent of logisticians and beneficiaries (American, 2000, p. 21; A. Thomas & Kopczak, 2005). This process influences the oversupply of certain relief supplies to beneficiaries. If needs assessments do not include beneficiaries, supplies are 'pushed' through the supply chain, and quantities are dictated by an upstream authority with little or no input from the beneficiary (Rodman, 2004). Furthermore, there is an opportunity to sell relief goods to dealers or to distribute them to persons not entitled to receiving them in return for bribes (Fletcher & Herrmann, 2012, p. 189).

Herein lays an opportunity for gaming between various actors when competition and opportunistic behaviour are apparent. For example, 3PLs (Figure 2) may eliminate competition between them by colluding. 3PLs could partner and monopolise the market to raise the asking price for their services or supplies. In retrospect, an LSP could also flood the market with cheaper supplies relative to their competitor to achieve a larger market share, and bid up the asking prices in the following periods. From an NGO perspective, a larger NGO could accept a higher price, compared to a smaller NGO, thus leaving the smaller NGO helpless. The smaller NGO will then be unable to produce capabilities to donor agencies, impeding them from receiving funds.

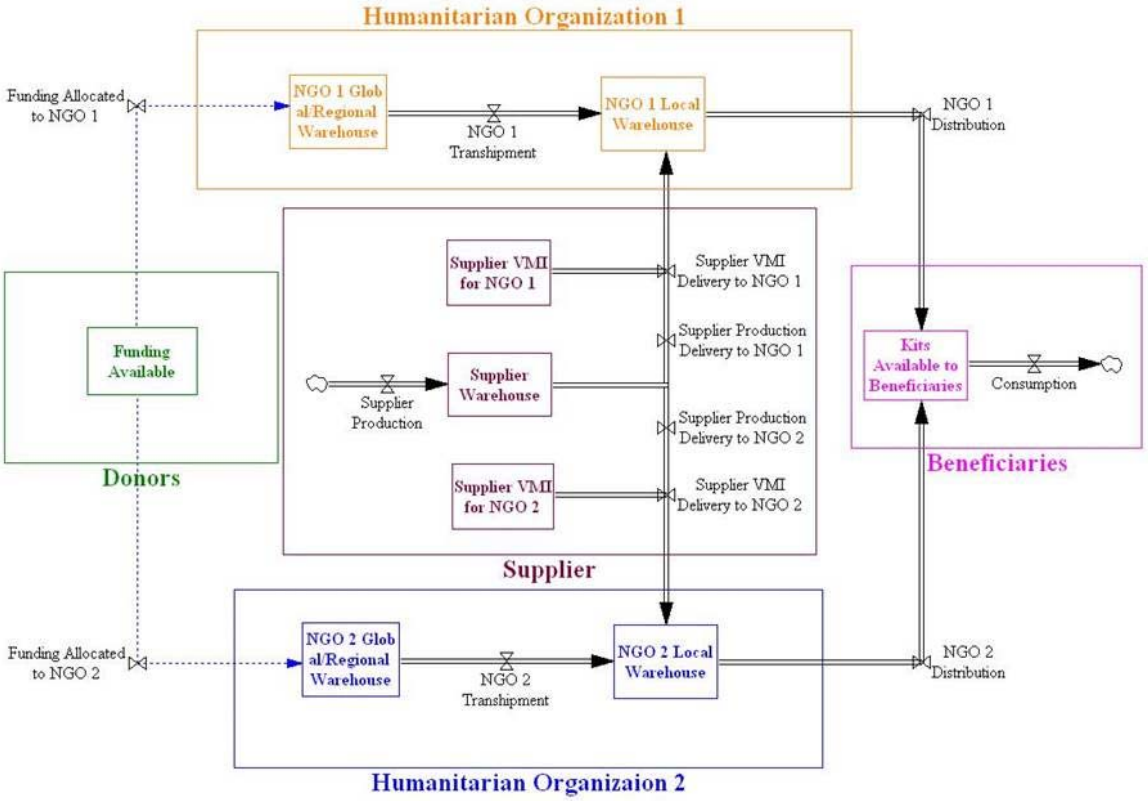
Although just an illustrative representation of the situation, donor agencies need to understand the market failures that occur in the HSC. This will assist donor agencies to better facilitate and orchestrate their funds to influence the right incentives to reduce competition, diffuse opportunistic behaviour, and encourage cooperation.

4. Case Study

To get a clearer picture and understanding of the inefficiencies that occur in the HSC, this paper uses a parallel study related to this subject. Ni (2013) uses System Dynamics (Forrester, 1961) to illustrate the interactions and inefficiencies in the HSC, and the various strategies for mitigation. Ni (2013) analyses strategies in a competitive environment in the HSC. The paper illustrates (Figure 3) how donors provide funding to support HRO operations, where the NGOs procure relief supplies and deliver them to the beneficiaries.

Based on the outcomes of the study, some of the key findings were that (i) improving the performance for small NGOs prepositioning strategy would lead to a reallocation of funding and worsen the overall outcome, due to lagged response

from the unplanned scaling up and (ii) if there are supplier constraints, only 1 NGO will have funding to procure orders.



(Ni, 2013)

Figure 3: System Dynamics of Humanitarian Supply Chain

In this scenario, opportunistic behaviour occurs when the smaller NGO captures donor funding by improving their prepositioning strategy, and signalling to donors that they have an advantageous capability to service demands. Donors then base their funding on the NGOs' capacity to service demand, thus providing funding to only one NGO. However, as demand is volatile, the NGO that received the funding is unable to scale up operations and to further exacerbate the situation, the competing NGO was not provided with any funding to procure relief items. Thus, beneficiaries suffer from unnecessary competition that occurs in the HSC.

An additional key finding in Ni (2013) paper is, that that when NGOs are symmetric, (i.e. warehousing, logistics and aid services), competition intensifies, and reveals that a preferential outcome would be if NGOs specialise in different services.

It is evident from this case study that there are inefficiencies with the competitive nature between various HROs in the HSC. HROs should cooperate rather than compete with each other, especially since the beneficiaries suffer more in the long-term. Furthermore, donors should pay heed to where their funds are channelled to and the impacts it has along the various levels (Figure A) of the HSC.

5. Mitigation

This paper proposes the use of mechanisms that utilises reputation as its core. Such a mechanism can be used to mitigate competitive behaviours between HROs, by creating the correct incentives. Incentives are a key variable in any thinking about the motivation, behaviour, capacity and institutions, as it influences individuals, groups or organisations to fulfil service delivery functions (Herbert, 2013). As agency profile is a major deciding factor in donor receivership (Minear, 2002, pp. 25-26), it would be feasible to create a unified platform that is publicly accessible to

the humanitarian community to access information on various HROs. This mechanism will allow HROs to continually update their profile through the means of increasing their 'rating' or reputation. As organisational reputation and perceived professional competence trumps as a basis for selection (Stephenson Jr & Schnitzer, 2006), such a mechanism will allow HROs to display their achievements, capabilities and also allow them to tender out their services, when required.

The key feature of this mechanism is the transparency of information. Donors can verify that the selected NGOs have the capacity and capability to meet demand throughout the time horizon. This dis-incentivises 3PLs and NGOs to be competitive or collude because donors have access to information on all the participating actors. For example, if a particular 3PL attempts to 'signal' to the donor that their organisation is the only operating service provider in the affected area, the donor is able to refer to the platform to verify that claim.

As reputational mechanisms are for the long-term, the HROs must also reveal their performance from inception. Therefore, it is necessary for HROs to implement a monitoring system to track performance. In this case, donors may decide on the measurements or HROs may choose their own measurements based on their capabilities. Monitoring will mitigate the actors from having opportunistic behaviours, as actors and donors can adequately compare information across a horizontal level amongst the actors. The transparency of such information would dis-incentivise the actors to bid up asking prices, as donors will be made aware that they are over-paying via the platform. Although these mechanisms could be a solution, it is restricted as a downstream strategy; upstream actors must also facilitate the right strategies to incentivise.

How the Scorecard is Implemented:

To implement the scorecards, selected communities are divided into focus groups (some distinctions here were dependent on the sector, such as learners and teachers in the education sector, while others were relevant across sectors, like traditional authorities). For example, in the education sector, the scorecard process was implemented in a given school community. This involved separating the community into groups by type of stakeholder including; learner (pupils); teachers and head teacher; parents; chiefs and so on. Each group would then collectively provide a 'score' against specific categories, such as pupil behaviour, teacher performance, or the quality of school buildings. Importantly, the scorecard process was facilitated in local languages, and used pictures to illustrate the scores. A 5-point Like scale was allocated per category – with 1 = very poor and 5 = very good.

The scores provided by the different groups were then used as the basis to develop of an aggregated score for a given site (such as a school), either by a simple averaging of scores, or a deliberative process of consensus building. The implementing organisation presents these results at a forum which includes relevant district actors (such as the District Commissioner, relevant sector managers, service providers, chiefs) alongside some members of the community.

(Harris, 2012)

Case Study 1: Scorecard Implementation

Donors (from an upstream perspective) should streamline their funding to other functions other than emergency/sudden onsets, to seek an extent of allocative efficiency. The aim is to reallocate NGOs services to reduce overall welfare loss, to both donors and beneficiaries. Donor funds are usually allocated to programmes with a certain percentage allowed for administration, which includes support services and thus there is a focus on short-term relief investments rather than systems and processes, which would ultimately reduce the expenses or increase efficiency in the longer-term (A. Thomas & Kopczak, 2005). Relevant to the monitoring mechanism, donors can influence the way NGOs provide their services, to reduce the competition and even facilitate cooperation, and move toward allocative efficiency. For example, a 3PL can engage the platform to tender out their specialised service of transporting goods and services to geographically constrained areas; whilst another NGO may be able to provide water supply to these areas too. This will not only reduce the competition for funding, but donors are also able to increase accountability by specifically allocating funds to specific actors that have specialised skill sets, which was presented as a beneficial outcome in Ni (2013).

Demand signals to determine requirements is an important factor in HSC (Day, Melnyk, Larson, Davis, & Whybark, 2012), as it streamlines information though the supply chain, so that resources are appropriately allocated. The needs assessment determines the quantities and types of supplies that are to be delivered. However, beneficiaries are usually not included in this process. Thus, during the needs assessments phase, a representative from each humanitarian actor should be involved in the assessment. The transparency in such a process will ensure that upstream actors are well informed of the required needs and also provide an incentive for downstream actors not to take advantage of the situation as their credibility as a representative is at stake. Such an informational channel will allow actors to make an informed decision with others in an HSC. An example of an elaborate incentive mechanism for the beneficiaries is the 'scorecard' method. Harris (2012) illustrates a 'scorecard' method, which is a community-based monitoring instrument to reinforce the conventional mechanisms to strengthen accountability and performance in service delivery. It is framed to strengthen the demand and voices of the affected population in relation to the service providers. Case Study 1 illustrates how the implementation of the 'scorecard' method is carried out. This method captures the needs of the beneficiaries and also determines the quantity and types of supply provided, which aims at removing the mismatch between demand and supply. This system will calls for a detailed accountability and the actors in the HSC are able to determine if supplies are being siphoned off or if there are persons/organisations reselling relief supplies to the unaffected population, thus reducing the risk of opportunistic behaviour.

In summary, the proposed reputational platform would increase the transparency between the HROs and improve performance measurement. The platform also incentivises (or dis-incentivises) actors, so as to reduce inefficiencies, competition and increase cooperation amongst the actors. Furthermore, the use of the proposed 'scorecard' method reduces the risk of beneficiaries taking advantage of oversupply. A combination of these mechanisms will create incentives to combat the competitive environment and reduce the opportunistic behaviours of commercial actors and beneficiaries.

6. Conclusion

As relief operations become more complex and versatile, there are a rising number of actors that participate and engage to provide services. This fosters unwanted opportunistic behaviors, competition and inefficiencies. Incentives through the right mechanisms may be used to mitigate such inefficiencies. Through these mitigation strategies, humanitarian actors will be able to reduce the competition between each other, share a larger portion of donor funding and ultimately mitigate the beneficiaries to suffer less.

This paper provides a framework and explores how incentives can mitigate the inefficiencies in the HSC. As mentioned, this paper is part of an on-going study to understand various incentives that may work and has worked in the field. The follow-up study will consist of a field study component to compare the results and learn from best practices. Further research can study how game theory models can be used and embedded with incentives.

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Biography

Dr Robert de Souza is the Executive Director and Chief Executive of The Logistics Institute – Asia Pacific. Prior to that, Dr. de Souza was Executive Vice President for V3 Systems in the Asia Pacific, Corporate Senior Vice President and Global Chief Knowledge Officer at Viewlocity Inc. and Vice Chairman and CEO of SC21 Pte. Ltd. Dr. de Souza is a Professor at the Georgia Institute of Technology in USA and a Senior Fellow at the National University of Singapore. He has published extensively and is a member of the Editorial Boards of the International Journal of Computer Integrated Manufacturing and the International Journal of Logistics Research and Applications and SMBNet. He is a Chartered Engineer and serves on multiple industry, government and academic committees, including the Government Parliamentary Committee (GPC) on Transport, the Advisory Panel of The Chartered Institute of Logistics and Transport, Singapore (CILTS), the IDA RFID Alliance (now part of the National RFID Centre), the IBM Global University Partners Leadership Advisory Board. He received his Ph.D., M.Sc. and B.Sc. Honours in the United Kingdom.

A former Colombo Plan Scholar, **Dr. Goh** holds a Ph.D. from the University of Adelaide. In the National University of Singapore, he holds the appointments of Director (Industry Research) at the Logistics Institute-Asia Pacific, a joint venture with Georgia Tech, USA, Principal Researcher at the Centre for Transportation Research, and was a Program Director of the Penn-State NUS Logistics Management Program. He also used to be Director of Supply Chain Solutions for Asia/Middle East with APL Logistics, crafting logistics engineering solutions for major MNCs in this part of the world.

Dr. Goh was a Board Member of the Chartered Institute of Transport (Singapore), past Chairman of the Academic Board of Examiners for the Singapore Institute of Purchasing and Materials Management, member of the Advisory Committee of the Transportation Resource Centre (NUS) and a past Vice President of the Operations Research Society of Singapore, Associate Senior Fellow of the Institute of South east Asian Studies. His other professional affiliations include membership of INFORMS, and the Academy of International Business. His biography appears in Who's Who in Asia and the Pacific Nations, Who's Who in the World, and Outstanding People of the 20th Century.

He has held appointments as a visiting Professor in Business Logistics Strategy at Chulalongkorn University, Commonwealth Fellow to the UK, Citibank International Fellow to the US, visiting research fellow at UMIST, visiting scholar at Beijing University, visiting professor at Melbourne University, and adjunct professor at the University of South Australia. He is currently on the editorial boards of the Journal of Supply Chain Management, Q3 Quarterly, Journal for Inventory Research, and Advances in Management Research, and has served as an associate editor for the Asia Pacific Journal of Operational Research.

His current research interests focus on supply chain strategy, performance measurement, buyer-seller relationships and reverse logistics. With more than 130 technical papers in internationally refereed journals and conferences, some of his recent academic articles on supply chain management have appeared in the Journal of Purchasing and Materials Management, Industrial Marketing Management, European Journal of Purchasing and Supply Chain Management, IIE Transactions, Naval Research Logistics, Physical Distribution and Logistics Management, Production and Operations Management, EJOR, Supply Chain Management Journal, Industrial Organisations, and Logistics Information Management.

Jonas Stumpf is Program Director for the Kühne Foundation – NUS Education Centre for Humanitarian Logistics Asia Pacific. Prior to that, he was a Project Manager at Kühne Foundation's "Humanitarian and Emergency Logistics Program" (HELP) where he worked closely with various actors from the humanitarian sector such as NGOs and local Governments to enhance their logistics capacity. His current focus is on supply chain seminars and research projcets for humanitarian actors in South-East Asia.

He has obtained his Master in Logistics and International Management from the University of Mannheim and wrote his Master thesis on "Emergency Logistics – Fields of Improvements". Before he joined Kühne Foundation, he worked at the Logistics Development Unit of the United Nations World Food Programme (WFP). During that time, he was member of the Supply Chain Optimization and Training team conducting field

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Colin Wee is a Research Engineer at the The Logistics Institute – Asia Pacific. He has conducted research across all departments including, urban logistics and humanitarian logistics. Colin has had work experience in Australia and South Africa. Prior to his appointment, Colin completed his Masters and Undergraduate at the University of Adelaide in Australia.