Using collaborative research methodologies in humanitarian supply chains

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Abstract

Purpose– The purpose of this article is to develop an existing collaborative research methodology process (Sabri, 2018), contextualise it for application in humanitarian supply chains and test it empirically.

Design/Methodology– Building on collaborative research methodology and humanitarian supply chain literatures, the Sabri (2018) collaborative research methodology process is further developed to comprise eight phases of collaborative research contextualised for the humanitarian supply chain domain. The process is applied in a collaborative research case of academia-practitioner knowledge co-creation in a humanitarian supply chain setting, focusing on environmental sustainability improvement. The collaborative case analysis suggests a number of refinements to the elements of the process. Two cycles of academia-practitioner collaborative research were undertaken.

Findings– In testing the process, a noticeable improvement in the collaboration among different humanitarian stakeholders was observed, leading to improved stakeholder management. The implementation improved the sustainability awareness and social inclusion of the affected population. Rurality, remoteness, security issues, and resistance of field staff against change were among the main challenges for supply chain researchers to engage in collaborative research in the humanitarian domain.

Originality/value –The article addresses the rigour-relevance-reflectiveness debate in the humanitarian supply chain domain. A collaborative research methodology process derived from action research is further developed using humanitarian literature, then applied in a humanitarian logistics case focused on environmental sustainability. The collaborative research methods process facilitates engaged scholarship among the humanitarian stakeholders, as the researchers' roles move from observatory to participatory knowledge broker.

Keywords Humanitarian supply chain, humanitarian logistics, collaborative research, action research, sustainability.

1. Introduction

The need for better coordination and collaboration in humanitarian supply chains is acute; this is primarily due to the high uncertainty at the demand and supply sides (Van Wassenhove, 2006), The need for risk mitigation in humanitarian supply chains because of this uncertainty has been emphasised (Ben-Tal et al. 2011). However, the particularities of these uncertainties make coordination and collaboration in humanitarian supply chains different to that in traditional, non-humanitarian settings (Gatignon et al. 2010). Therefore more research on how to improve coordination and collaboration in humanitarian supply chains is required.

Despite recognition of the need for more research, concerns have been expressed about the limitations of ongoing research in humanitarian supply chains because of the proliferation of use of particular research methodologies. In the humanitarian supply chain domain, simulations, modelling and qualitative case studies are dominant methodologies (Kunz and Reiner, 2012). However, their appropriateness for addressing multidimensional challenges of this complex, uncertain environment has been the subject of debate (Näslund, 2002; Näslund et al., 2010). Using the same, limited range of research methodologies can lead to *'produce[ing] similar questions and answers'* (Gammelgaard, 2004; p.479). The same notion is expressed in Näslund (2002; p. 327).

"If researchers within a certain academic discipline do the same kind of research as everyone else within the discipline, then how useful will that research be?"

There might be usefulness in this kind of research, albeit '*not useful enough'* (Gammelgaard, 2004; p.483). The intent behind this research is not to undermine or replace other research methodologies, as all types of research are needed (Näslund, 2002) since they reflect how logistics and supply chain researchers view reality from different perspectives (Gammelgaard, 2004). However, knowledge of humanitarian supply chains cannot grow and achieve the hopes it holds, for its researchers and practititioners, if it continues to create that knowledge using the same methodologies (Näslund et al., 2010).

A further concern with humanitarian supply chain research is the rigour-relevance gap (Bartell et al., 2006; Jahre et al., 2015; Kunz et al. 2017; Sohn, 2018). This has increased interest in the use of research methods that might help close this gap. Collaborative research methods in humanitarian settings involve research collaborations between academics and practitioners, practitioners and affected populations, academics and affected populations, and academics, practitioners and affected populations. To enable the creation of practically relevant and theoretically based knowledge, frameworks and

models, research in humanitarian settings would benefit from a proactive approach of academia-practitioner collaboration to research across university, institutional and organisational boundaries (Bartell et al., 2006; Prasad et al., 2017). As such, collaborative research methodologies with their participatory focus, bridge two worlds; academic concepts and practitioners operating models (Chang et al. (2010), and create contextually relevant knowledge (Sohn, 2018). Engaged scholarship is "… *a collaborative form of inquiry in which academics and practitioners leverage their different perspectives and competencies to coproduce knowledge about a complex problem or phenomenon that exists under conditions of uncertainty found in the world."* (Van de Ven and Johnson, 2007; p.803) and therefore it appears to be a very relevant research methodology for humanitarian supply chain research.

In the present research we use an existing collaborative research process (Sabri, 2018) and contextualise it to apply it to a humanitarian logistics problem. The collborative research methodology process presened here is based on similar earlier processes from the supply chain and operations management domain (see e.g., Coughlan and Coghlan, 2002; Näslund et al., 2010). Moreover, we incorporate learning from the collaborative humanitarian field expereinece reported in prior literature (see e.g., Chandes and Pache, 2010; Jahre et al., 2012; Pedraza-Martinez et al., 2013; Jahre et al., 2015; Prasad et al., 2017). Through analysis of 17 collaborative research projects in the broader humanitarian setting, themes from these are used in the contextualisation of the methodology process.

To test the developed process, we apply it in a humanitarian logistics case relating to environmental detriment caused by packaging in humanitarian supply chains. Environmental sustainability has not been sufficiently addressed in humanitarian supply chains in practice; Eng-Larsson and Vega (2011), Sarkis, Spens et al. (2012), Haavisto and Kovács (2014), Abrahams (2014), and Kunz and Gold (2017) all call for more research on this topic in humanitarian logistics research, highlighting that as humanitarian operations increase globally, so does the environmental burden they cause. The attention of scholars in the humanitarian arena has largely been, to date, directed to disaster relief, focusing on improving preparedness and response (Leiras et al., 2014). The urgency of humanitarian response to disasters may be perceived as outweighing the need for sustainability (Cravioto et al. 2011).

We apply the developed process in a single case with two cycles of collaborative research between academic and practitioner partners in a humanitarian supply chain setting. After

the case analysis, we refine elements of the process and provide insights on lessons learnt from the research.

The contributions of the present research are threefold. First, to the best of our knowledge, this study is novel in providing a comprehensive process for collaborative research in humanitarian supply chain settings. Second, we provide empirical findings on how collaboration between academics and practitioners helped to improve sustainability of the management of packaging in humanitarian logistics supply chains. Third, we identify the implications, benefits and challenges of engaging humanitarian supply chain researchers and practitioners together in a collaborative research project. In so doing, the outreach of humanitarian logistics research is increased (Kovács, 2012), and decisions in humanitarian crises can be based on appropriate evidence (Pedraza-Martinez et al., 2013; Sandvik and Lemaitre, 2013).

The article is organised as follows. First, we examine collaborative research in section 2. Next, section 3 discusses collaborative research in humanitarian supply chains and proposes a collaborative research process. The application of the process to a humanitarian case is shown in section 4. Then, the findings and refinements to the process are discussed in section 5. Finally, section 6 concludes the article and summarizes theoretical and practical contributions.

2. Collaborative research methodologies

Basing practice decisions on research evidence has a long history in the fields of law, medicine and public policy, entering the field of management more recently (Pfeffer and Sutton 2006). The process of evidence-based decision making involves formulation of the research question, gathering appropriate research findings and evidence, assessing the validity, quality and appropriateness of the evidence to the problem in hand, presenting the evidence in a way that is useful to the decision-making process, then, applying it to that decision-making process (Gray 2004, Kovner and Rundall 2006). There are various approaches to evidence-based management that follow similar processes from problem identification to decision and evaluation (Robbins 2008). Engaged scholarship emerged as a way to enable co-creation of knowledge, and to facilitate the engagement and integration between members of the academic and practice-based research team (McLean et al., 2002; Van de ven and Johnson, 2007). For management research to be termed collaborative, two parties or more need to be involved in the knowledge co-creation

process, of whom at least one is a practitioner (Pasmore et al., 2008). This type of collaborative management research is positioned close to the Scandinavian tradition of interactive research (see e.g. Ellström, 2007; Svensson et al., 2007). Co-creation of knowledge entails having shared objectives, jointly deciding on the research purpose and mutually framing the research questions. It may also require co-designing of action plans and co-evaluation of the project outcomes (Shani et al., 2012).

Types of collaborative research methodologies

Shani et al. (2004) identify eight types of collaborative research methodology; action science, appreciative inquiry, clinical inquiry, developmental action inquiry, intervention research, participatory inquiry, table tennis research and action research. Collectively, they are concerned with action, intervention and transformation that leads to theory building and knowledge co-creation. Some of the outlined eight types are viewed by other scholars as a participatory approach to inquiry and the research process; Bradbury (2013, p.3) questioned whether action research is a methodology of its own:

"*Action Research is not a method, but an orientation to inquiry, with many schools, theories and practices*".

Hence, it could be applied in the settings of a case study (see e.g. McManners, 2016).

Collaborative research in humanitarian supply chains

The application of collaborative research methodologies in humanitarian supply chain research has been very limited. In some instances, when adopted, researchers have not explicitly reported using a collaborative research methodology, such as Tomasini et al. (2009), where it is evident that collaboration methodologies and coordination schemes can significantly reduce costs and enhance the preparedness and response of humanitarian supply chains. In other cases, researchers specifically identify use of a type of collaborative research; in Appendix 1 we present 17 collaborative research projects in the humanitarian domain. In Chandes and Paché's (2010) study the research team used observant participatory action research as a methodology; one of the team members was embedded (employed) in the practitioner environment. Jahre et al.'s (2012) study used action research with more than 50 interviews and 27 site visits. Rigour was ensured by cross-referencing data from multiple sources and having two researchers conduct the interviews and site visits swapping roles between participatory and observatory researcher. In Pedraza-Martinez et al., (2013) participatory research was used to co-

identify the research problem, develop optimisation models for vehicle routing and fleet management in the humanitarian field and implement these in humanitarian organisations. Jahre et al.'s (2015) empirical study ensured research rigour through triangulation of multiple methods for data collection and analysis and using multiple researchers with different roles. The research project had cycles of interventions and the research team, including humanitarian practitioners, had reflective sessions to discuss data analysis and needed intervention.

Collaborative research in humanitarian settings has involved collaborations between combinations of academics, practitioners and affected populations. The focus of this article is on academic-practitioner collaboration. Sandvik and Lemaitre (2013) used a case-study design combining traditional methods of legal analysis, ethnographic observation, and participation amongst university researchers and a research committee set up by an NGO. Refstie and Brun (2011) used co-identification of a research problem and co-analysis by academics and practitioners in focus groups. Chang et al. (2010) used multiple rounds of action research intervention with reflective sessions involving researchers and practitioners. Prasad et al. (2017) used a mixed-method approach between action research and non-linear integer programming-based simulation, with a team of researchers and officers of an NGO. From these studies, evidence of the following challenges are summarised in Table 1.

Please Insert Table 1. Challenges of collaborative research in humanitarian settings

Despite these challenges, many benefits of collaborative research in humanitarian settings are reported, summarised in Table 2.

Please Insert Table 2. Benefits of academic-practitioner collaborative research in humanitarian settings

3. A process for collaborative research in humanitarian supply chains

Collaborative research processes are cyclical, and the outcomes are co-evaluated on multiple iterations through phases of: planning, intervention, taking action, and reflectiveness, which can lead to transformation (Canterino et al., 2016). A collaborative research methodology should contribute to theory building of the supply chain domain

(Coughlan and Coghlan, 2002) through high level involvement of both researchers and practitioners (Schein, 2006).

Prior research has provided various collaborative research methodology processes based on action research in the supply chain and operations management domain (Coughlan and Coghlan, 2002; Näslund et al., 2010; Sabri, 2018), as well as the rich humanitarian field experience reported in a number of collaborative research projects, (see e.g., Chandes and Pache, 2010; Jahre et al., 2012; Pedraza-Martinez et al., 2013; Jahre et al., 2015; Prasad et al., 2017, and Appendix 1). Here we combine learning from both these domains to develop a collaborative research process oriented to research in humanitarian supply chain settings. This process is based on the phases proposed by Sabri (2018) and expands elements specifically for the humanitarian logistics context.

In line with other collaborative research methods processes, ours starts by forming a collaborative team, understanding the research problem's context and purpose then proceeds to data collection, practitioners' orientation, collaborative data analysis, joint planning for action, implementation and evaluation and ongoing monitoring.

Please insert Table 3. Collaborative research process for humanitarian supply chain research

4. A Collaborative Research Case – Sustainable Humanitarian Supply Chains

4.1. Context

This case is on research and practice of environmental sustainability of humanitarian supply chains. Environmental sustainability has not been sufficiently addressed in humanitarian supply chains; see, for example, Eng-Larsson and Vega (2011), Sarkis, Spens et al. (2012), Haavisto and Kovács (2014), Abrahams (2014), and Kunz and Gold (2017). Because of the increasing scale of global humanitarian operations and the urgency of humanitarian logistics, an increasing environmental burden is occurring, such as the consequential cholera outbreak in Haiti (Cravioto et al. 2011). Green practices may not simply be transferred from commercial sustainable supply chain management and applied to humanitarian logistics due to the fundamental differences between these settings. Such differences make it imperative to collaborate with humanitarian practitioners to develop contextualized green practices that fit the specificities of humanitarian logistics. Hence, the researchers were driven by the following research question:

"How can researchers and humanitarian practitioners collaborate to improve the environmental sustainability of humanitarian logistics, considering the specificities of humanitarian context?"

4.2. Methodology

Overview

This case applies the phases in our collaborative research methodology process. It is focused on collaborative research between an academic partner and a large international humanitarian organisation (HO). The HO is headquartered in a developed country with many regional and national delegations around the world. Its purpose it to help populations affected by natural disasters and armed conflicts by providing food and shelter. This collaborative research focuses on improving environmental sustainability of the HO's operations in its supply chains.

While embedding environmental sustainability into humanitarian logistics was the main area of investigation of mutual interest, managing packaging waste was chosen as an initial area of focus because of growing concerns in the HO regarding the amount of waste generated by their operations and the way it was disposed. Concern was growing especially in developing countries and crisis-impacted regions with limited resources for recycling and waste management. In the same line, the criticality of packaging in the humanitarian supply chain has been highlighted by previous research (Sohrabpour, Hellström et al. 2012, Regattieri, Gamberi et al. 2018), exemplified by past adverse consequences in the field. For example, empty water bottles were left in the environment after consumption by beneficiaries in Afghanistan (Haavisto and Goentzel 2015) and large-scale disposal of ready-to-eat meals in hard plastic containers delivered to Haiti caused environmental problems (Sarkis, Spens et al. 2012).

The collaboration for this research lasted 19 months during which two collaborative research cycles were completed. The first cycle was completed in nine months and identified unsustainable operations, focusing a pilot study on one area with the highest perceived environmental impact. The second cycle spanned 10 months, evaluating outcomes of the first cycle, and improving the implementation of the pilot.

Forming the collaboration team

Three large humanitarian organisations were targeted as potential research partners with an assumption that larger scale operations may give rise to greater environmental impact. Only one was willing to engage in collaborative research. From the HO side, they wanted

information on the background of the researchers and their previous projects with other organisations. The research team was comprised of two researchers with backgrounds in supply chain management and engineering with specific expertise in humanitarian logistics and environmental sustainability. The practitioner team consisted of three members: the chief logistics manager, the logistics coordinator of Africa (the region with the highest environmental concerns), and the environmental and sustainable development advisor. The collaborative research method (CRM) team was therefore a hybrid community of inter-disciplinary researchers and expert individuals from the HO.

Understanding the problem and context

A memorandum of agreement was signed specifying the goal, scope and responsibilities of each party, confidentiality of data, the expected duration and deliverables of the project. Based on that, the main responsibilities of the practitioner team were providing access for the researchers to organizational data, operations sites, providing detailed feedback on the recommendations of the researchers, and the implementation of approved action steps in the field. A CRM-based methodology was selected and upon the confirmation of the analysis, the researchers conducted a review on green disposal methods for packaging within a two-month period.

Data collection

In the first cycle of research, after signing the memorandum of agreement, the HO arranged for more than 20 interviews of 40-60 minutes within four days of a visit between the researchers and the heads of logistics, warehousing, procurement, research and development, and water and sanitation. The interviews were conducted using open-ended questions. The interview protocol was developed based on the problem statement and research question. The interviewees were asked about their responsibilities, how they thought their responsibilities connected to environmental sustainability, what were the major sustainability concerns, and potential solutions to address those concerns. All the interviews were audio-recorded to be coded later. Another visit was planned to a refugee camp in Kenya to observe end-of-life management of packaging *in situ*. In addition to the qualitative data gathered from the visits, the researchers were granted remote access to several organisational databases through which quantitative data about the HO's operations were gathered. The practitioner team contributed to data gathering by granting access and helping the researchers in *sensemaking* of organizational data whenever there

were ambiguities. While data collection was a continuous process throughout the partnership, initial data collection from different sources took about two months.
In the second cycle, two joint CRM meetings were held in the headquarters; more interviews were conducted with the HO staff. Following perceived success in the first cycle, the HO expanded remote access to the researchers of their databases.

Practitioner orientation
Based on the collected data from the headquarters and the field, the researchers conducted a preliminary environmental analysis of the HO's packaging. The assessment included all the environmental impact categories from last-mile distribution to end-of-life. The practitioner team assisted the researchers by answering queries and providing further data on the fate of packaging. The research team presented the results of environmental impact assessment during an online meeting.

From the second cycle, based on the collected data from suppliers and the field, the researchers developed a *cradle-to-grave* environmental analysis for packaging starting from suppliers to disposal.

Collaborative data analysis
In the first cycle a joint meeting was held at the headquarters where the research team presented the problem, a synthesis of the collected data, and the methodology used to develop green practices, involving a literature review, setting of benchmarks, followed by contextualization of practices for the collected data. Specifically, humanitarian factors that might impact on implementation of green practices were jointly analysed. The joint discussion led to a *shared understanding* of the issue before proceeding to co-develop action steps (Shani, Tenkasi et al. 2018).

In the second cycle greening solutions were proposed to redesign the packaging. These were sent to the practitioner team to elicit feedback prior to another joint meeting. The practitioner team sent the solutions to internal quality control advisors and also suppliers. In this cycle the CRM team focused on collaborative sense-making about any actions that appeared to have been less successful in the first cycle.

Joint planning for action

Based on feedback from the first cycle, it was jointly decided that the researchers focus on the design of packaging for food ingredients since changing medical products' packaging was unlikely due to medical regulations and high standardization.

In the CRM process, the researcher and practitioner teams engaged in conversational inquiry to generate a shared understanding and planning for action (Canterino et al. 2016). This involved discussing possible scenarios for action, assigning responsibilities for implementation, and defining details of the action plan (Shani et al. 2018). The action plan focused on incinerating food packaging waste local to the refugee camp.

Implementation and evaluation

Instructions were communicated to local staff and an incinerator was installed near the refugee camp. Implementing the action plan in the field is the most important step that influences not only the practical outcomes, but also the impact of using CRM (Shani et al. 2018).

Monitoring

Evaluating the quality of a CRM study involves a continuous effort by researchers to achieve a balance between scholarly rigour, reflectiveness, and relevance (Canterino et al. 2016). In this project the researchers considered scholarly rigour from the initial stages of research design. During the first cycle, the interviews were designed based on the research question while they captured the peculiarities of the humanitarian organization's operations. Since conducting CRM in organisations requires distinct quality criteria (Coghlan and Shani, 2014), rigour, reflectiveness and relevance were assessed during and after each cycle, the results of which are reported in findings below.

4.3. Findings

Forming the team

For the research to be successful, it was crucial that the practitioner partners were committed to intense collaboration from the outset. Of the three HOs targeted, only one expressed this commitment. Choice of organisational partner was critical prior to attempting to commence collaborative research. Because academic access to corporate elites to conduct research is challenging (Welch et al, 2002), it is an unusual situation for academics to have to choose between partner organisations, but it is essential in

collaborative research. This choice was a two-way process with the practitioner partners examining the suitability and credibility of the proposed academic partners. This resulted in confidence forming prior to the commencement of research. This confidence building extending into the field team: because field staff were recruited in the first cycle of research, there was less resistance by the time the second cycle was conducted. Early involvement of practitioners who may be involved later in implementation has been found to be an important element of collaborative research in other settings (see, for example, Suarez-Balcazar et al, 2005).

Understanding the problem and context

Conflicting objectives between urgent response to save lives and engaging in environmental sustainability were a source of ongoing tension in the research, as illuminated in interviews.

"*Some people here still argue that our job is saving lives and environmental sustainability is not our mission.*" Logistics manager of the HO.

The cyclical approach of CRM requires the review of the outcomes and the lessons learnt from the previous cycle (Shani et al. 2018). The implemented actions and their outcomes from cycle 1 were reviewed at the beginning of cycle 2 to revisit the shared understanding of the problem and context. The practitioner team reconfirmed that packaging waste was a pressing concern:

"*We are facing [a] large amount of packaging in the field mostly made from plastic. I think it is a great starting point.*" Logistics coordinator of Africa.

Data Collection

Learnings from the first cycle revealed that significant volumes of packaging waste could be avoided through better packaging design. In the second cycle, therefore, the attention of the CRM team turned towards collecting data from suppliers. Three major suppliers of food ingredients and medical products were selected by the practitioner team and connected to the research team. The researchers collected data from the selected suppliers using a questionnaire about technical specifications of the packaging used, followed by three one-hour interviews with production managers about packaging design, quality, and waste during production.

Practitioner orientation

In a joint meeting with the practitioner partners, the research team presented a summary of action steps from the first cycle, evaluation of outcomes, and proposed the project should enhance green practices.

Collaborative data analysis

In the analysis, the practitioner team dismissed some of the proposals because they perceived them as inappropriate to the HO's supply chain. For example, the proposal to export packaging waste to a neighbouring country with a recycling facility was rejected. While this practice is used in commercial supply chains (see, for example, Rucevska et al, 2017), it is more difficult to do in humanitarian supply chains due to tensions at the borders, lack of support from authorities, and poor import/export legislation.

"*Even within a country, we have problems moving waste from remote areas to the capital for recycling. Let alone transporting waste across the borders. The governments would not allow to import packaging waste*" Logistics coordinator of Africa.

Other impeding factors were poor recycling facilities in developing countries and regions impacted by a crisis, lack of robust national regulations, limited beneficiaries' awareness of proper disposal methods, and the HO's negligence to design reverse logistics properly. Additionally, expired products were a major problem as they required separation of the content (e.g. food or medicine) from the packaging prior to recycling.

Comparing analysis with the benchmarks set for packaging waste in the project revealed that many refugees receiving food products were far from waste collection points in the camp; the practitioner team were not previously aware of this problem. The existing waste collection points and bins were designed by the HO several years previous when the population of refugees in the camp was far less. Based on these new insights, the CRM team jointly assessed requirements for additional waste collection points and optimal locations for them.

As for packaging design, analysis of the questionnaires and interviews with suppliers revealed room for improving sustainability of packaging through reducing use of plastic or substituting with cost efficient greener alternatives. While agreeing with the proposed

solutions, the practitioner team argued that such changes should not be expected overnight but could be developed through long-term collaboration with suppliers.

Joint planning for action

The action plan contained three main steps tackling disposal of waste. First, the CRM team proposed to raise beneficiaries' (refugees receiving food) awareness about proper waste disposal at the time of food distribution. The plan proposed training field staff to show beneficiaries how to dispose of packaging after consumption and where their closest waste collection point was. The second action proposed providing financial incentives to people collecting packaging waste; this engaged the local populations in the camp, providing social and economic benefit in additional to environmental gains. The third action focused on disposing of expired products through incineration and landfill, taking care to avoid leaching of organic waste into underground water through use of cement where water tables were high. This third action resulted in the formation of disposal instructions for packaging and expired products with non-hazardous material. The HO management team agreed to assign budget to buy a mobile high-temperature incinerator to implement this action point.

Upstream in the supply chain, three actions were planned with respect to suppliers. First, suppliers were asked to include visual presentation on the packaging of how to dispose of it after consumption. Second, compliance over the coming years with Forest Stewardship Council certification was requested of suppliers. This focused on recycling cardboard materials for reuse as shipping boxes, eliminating plastic from gross boxes and carton liners, and encouraging use of biodegradable packaging. Third, *take-back* clauses were added to new contracts with suppliers.

Implementation and evaluation

Downstream in the supply chain in the refugee camp, the number of communal storage bins for domestic waste was increased. Efforts to encourage beneficiaries' awareness of waste disposal were intensified through adding education workshops and targeting instructions on waste disposal to heads of families. However, in the refugee camp in Kenya these actions had limited effect. Efforts on reverse logistics planning were greatly improved, minimizing open-air incineration and increasing transport of waste to the newly installed incinerator, as highlighted in the dialogue below:

"*Do you think it will have less environmental impact than burning them locally? Because it adds a shipment.*" HO Logistics manager

"*Yes, sending by a truck emanates way less emissions than burning large quantities of packaging in open air*" Researcher

"That's interesting because to me, I would have been clueless, but for you it's easy 'cause you know it has higher impact with the low temperature burning. Do we have some sort of evidence or graph on that?" HO Logistics manager

"*Yes, that is in the environmental analysis report.*" Researcher

"*Super! I think we should include that in our guidelines to the field.*" Logistics manager

This dialogue illustrates how co-inquiry evolves in the context of application through the engagement of CRM members (Coghlan and Shani 2014) and how researchers can play a role in presenting academic knowledge to practitioners to bring about change in organizations (Shani, Tenkasi et al. 2018).

Local staff were already dealing with large amounts of expired items (e.g. therapeutic food) due to the influx of unsolicited international donations following a past crisis in the region. Before incineration, outer-box packaging was removed since it was made of cardboard which could be easily recycled or reused. The instructions mandated that at least two permanent, non-volunteer staff should accompany and supervise the disposal process to mitigate risk of pilferage. Despite increased costs for transportation and incineration, the exercise was perceived as successful.

The financial incentive for waste packaging collection was successful for polypropylene packaging but less so for other types of packaging that tended to be more contaminated by food leftovers and mud and had to be cleaned before weighing and subsequent payment.

The growing mounds of food packaging waste and emergency supplies were palpable in the camp posing health concerns; septic tanks and pit latrines became blocked and malaria and yellow fever carrying mosquitoes bred more rapidly. During the four months implementation revisions and tweaking were required, but broadly the implementation phase were viewed as successful.

Implementation was rolled out to more delegations in the south and east of Africa. Gradually visible results in reducing packaging waste were observed. However, reluctance was experienced, reemphasising the importance of early involvement of field staff in the co-creation of action steps.

Suppliers made good progress. All packaging was revised to include instructions on proper disposal. Reduction of plastic and use of greener substitutes was ongoing but being achieved gradually.

Monitoring

Monitoring was performed through examining rigour, relevance and reflectiveness, as presented in Table 4.

Please insert Table 4. Rigour, relevance, and reflectiveness criteria in the present case

5. Discussion

The inclusive nature of collaborative research impacted suppliers, affected populations, local humanitarian workers, the international humanitarian organisation and the research team. During the research process, trust has increased amongst members of the collaborative research team. As a result better coordination and decrease of adverse effects of uncertainty was observed, improving management across the stakeholders in this complex network of actors.

In contrast to propositions of previous studies (c.f. Sabri, 2018), as depicted in table 5, there was no evidence of adverse impact of the changes on donations or post-disaster management. However, these are more influenced by the crisis itself, rather than the logistics response to the crisis. Overall the improvement of waste management processes at the affected location and improvements to the packaging design and process at suppliers were substantially improved. Awareness of the affected population had noticeably increased leading to improved social inclusion in the efforts. Implementation of the collaborative research methods process, contextualised for humanitarian supply chains, was viewed as successful, in the main.

However, several challenges of using collaborative research methodologies were encountered in this research. First, forming the team took substantial time and effort to engage a humanitarian organisation and negotiate the nature of that engagement with

them. As this research project was not granted funding, only access to rich data, the costs of these efforts were borne by the researchers and their universities.

Please insert Table 5. Expected versus actual implications of applying CRM in humanitarian supply chains

Trust is a cornerstone in successful collaborative research. One of the HOs approached was interested in the research problem but was unwilling to collaborate more than be interviewed and engage in observational research. This may be because of lack of trust in the researchers or in the methods and shared responsibilities of collaborative research. Trust was crucial to project continuation (here, to the second cycle of research) and future research. Post this research the HO actively pursued further discussions for future collaborative research.

Tweaks and changes to the collaborative research methods process used were made. In the initiation phase of this research project, to manage the stakeholder's expectations, the research team and HO signed a memorandum of agreement, so as to have a clear explanation of the scope and aim of the research. Furthermore, to avoid any conflicts, this memorandum identified the CRM team members, their roles, and the range of their intervention during the different phases of the research project. The memorandum provided clear identification of the deliverables of the research team, and the expected time horizon for the collaboration. Adding to the process a requirement for a detailed, signed memorandum was perceived to be vital to the success of using collaborative research methods.

In the data collection and data analysis phases, there was no manipulation by the management team as their genuine intent was to solve the issue from its root causes; as such, they provided the researchers with full access to high-quality data and facilitated their field visits. Explicit mention in these phases that data access, collection and analysis should not be manipulated by the practitioner partners sends a clear signal of the need for openness in collaborative research.

Implementation challenges that impacted on the collaborative research included:

- unpredicted factors that impact on action plans, such as budget restrictions
- frequent movement of employees in humanitarian organisations, making it difficult to maintain long-term collaboration

- being prone to procrastination by practitioner partners until feasible results are visible, making the collaborative research very time and resource consuming

The monitoring phase was performed by an internal member of the research team, rather than triangulation with an observer researcher as proposed in the collaborative research methods process. This project suffered from lack of funding so persuading a third party researcher to engage without funding proved unsuccessful. Triangulation of methodologies and engagement of external interdisciplinary researchers is very challenging in practice; planning more in advance for this might help, but there is no simple solution to how to conduct collaborative research in highly resource constrained settings, such as humanitarian supply chains.

Whilst this research used academic-practitioner collaboration in the collaborative research methods process, unexpectedly during application of the methods, affected population engagement became a feature of the research (through incentivising collection or waste and providing education to improve waste disposal). This was not anticipated at the outset of the research and highlights the need for flexibility in use of collaborative research methods. The act of engagement and collaboration gave rise to these changes, emphasising the challenges of planning and controlling collaborative research projects.

Another important observation was a noticeable resistance of the humanitarian field staff to change. In this research the second cycle was conducted more easily in the refugee camp where the field staff were already involved in the first cycle, as compared to implementation in other countries where field staff had had no prior involvement.

Collaborative research is much more time-consuming than conventional research approaches. Case studies may be conducted in a few months in non-engaged scholarship, but a CRM-based case study sometimes requires years to build trust, devise action steps, complete cycles of implementation, and observe and reflect on the changes.

The in-depth nature of engaged scholarship in a single case study over time in a deep, extended collaboration, is appreciated for the richness of research findings (Dyer et al, 1991) but developing theoretical constructs leading to theory building may require reflectiveness across a number of such cases (Eisenhardt, 1991). As such it is recommended as more appropriate to early stage exploratory research or late stage theory testing (Yin, 2017). However, single case study research is still plagued with criticisms of idiosyncratic nature of the sample of one (Stuart et al, 2002).

A particular challenge of collaborative research in humanitarian supply chains lies in the nature of humanitarian aid being reliant on donations. Disclosure of action research

results and reporting any shortcomings of practitioners in publications can impact on the social image of the practitioner organisations. The temptation of HO managers to present a positive light on their operations might be strong, though CRM studies are likely to expose and try to improve failings.

5.1 Summary of refinements to the collaborative methods process

In the first phase of understanding the context and forming the research team, we suggest signing a memorandum of understanding that clearly defines the role of each actor in the team and a potential time-line for the research project. This helps in expectations management of each party (i.e. the researchers and practitioners) and better management of the research cycles.

To overcome the implications of frequent rotation of humanitarian officers in the field, the practitioner orientation phase should include a step where researchers make sure there is a mechanism for internal knowledge sharing to orient the substitute practitioners and align them rapidly with the objectives of the collaborative research project. Electronic communication technologies such as webinars or recorded online trainings can be of help here. Moreover, researchers should keep track of all the collected data through recording interviews and reflective sessions, taking photos (e.g. from plastic waste in the refugee camp in the presented case), and other measures of data storage. This is important especially due to volatility and fast-changing nature of the humanitarian logistics context.

In the 'joint planning for action' phase, it is suggested to consider it as a composite of two main sub-steps. First, different scenarios of collaboration under different possible situations that might arise in future should be developed. This pertains to the uncertainty within the humanitarian context and differentiates application of CRM-based methods in humanitarian logistics from commercial logistics. Second, unlike commercial logistics settings, it is not a dyad of practitioner-researcher collaboration that results in the co-creation of actionable knowledge, but the "triad" of *humanitarian organisations managers-field staff-researcher* and even the "tetrad" of *humanitarian organisation managers-field staff-affected population-researcher*. If the actions are planned in the absence of, or without communicating with field staff, there are high chances of failure in implementation because some peculiarities of the field may not be seen and field staff might be reluctant because they were not involved earlier.

6. Conclusions

6.1 Contribution to theory

The central thesis of this article is to challenge the prevalent understanding of knowledge generation in the humanitarian supply chain domain, previously based on use of a limited range of research methodologies (Kunz and Reiner, 2012; Naslund, 2002; Naslund et al 2010). Collaborative methodologies have been shown here to be perceived as appropriate to humanitarian supply chain research (Sohn, 2018; Sabri, 2018; Prasad et al, 2017) but, to date, only generic collaborative research methodology processes have existed (Coughlan and Coghlan, 2002; Nashlund et al, 2010; Sabri, 2018). This article contributes a collaborative research methods process, contextualised for research in humanitarian supply chains through integrating existing generic processes with findings from collaborative research conducted in humanitarian settings. The resulting eight phase process was tested and refined in an exploratory in-depth case. The positive impact of the research on humanitarian logistics and affected populations supports the efficacy of the process. The process therefore contributes to supply chain management theory, in testing the use of collaborative research methods in supply chains, but more specifically to humanitarian logistics theory through provision of a unique process, contextualised to that setting.

6.2 Contribution to practice

Humanitarian logistics managers within the research learnt from the collaborative research process and outcomes, making substantial logistics improvements to the environmental sustainability of food packaging design and disposal. Collaboration across the various stakeholders relating to the environmental detriment caused by food packaging improved as a result of using collaborative research methods; this collaboration led to positive, practical impact. Supplier development improved as a result of the joint initiative to redesign packaging and its reuse in the supply chain. This exploratory research can be built on in the humanitarian logistics field through further application of this new collaborative research methods process, through increasing collaboration with academia to solve problems in the field. Greater understanding and awareness of the power of academic-practice collaboration to help solve the many wicked problems faced in humanitarian settings should provide new avenues for supporting

improvement initiatives. Highlighting attention on the humanitarian logistics aspects of crises, and the potentially powerful role suppliers and logistics can play in preventing spill-over burdens of humanitarian aid to local societies (e.g. increased risk of malaria, yellow fever and cholera) and environments (e.g. polluting local water supplies) encourages action beyond the immediate crisis to consider longer term implications.

Engagement of locally affected populations (in what became a tetradic, or 4 party, collaboration of academics, humanitarian organisation managers, local field staff and affected populations) impacted on their lives through reduction of hazards affecting health, and through economic and social inclusion. Their awareness of the importance of sustainable development relating to donated food improved; however in some of the African nations where this was rolled out, this awareness did not lead to substantially reducing problems of waste disposal.

It is likely that the long term, collaborative nature of this research and the implementation of the collaborative research methods process, is more appropriate to post-crisis logistics situations and long term crises, such as tackling poverty or migrants, but less so for rapid response situations.

6.3 Limitations and future research

A single, exploratory case doesn't provide statistical generalisability of the findings. However, the findings provide analytical generalisability and transferability to relevant domains. Further application in other aspects of humanitarian logistics of the collaborative research methods process provided here would enable more general understanding of the appropriateness of collaborative research methods. However, the resource intensity of using collaborative research methods in environments constantly in flux, subject to great uncertainty, as are those in humanitarian settings, combined with lack of research funding, prohibits substantial application. High and rapid staff turnover in the field, challenges of engaging large numbers and variety of stakeholders and uncertainty of convergence of donations all exacerbate complexity and resource demands on humanitarian logistics researchers. The nature of collaborative research entails higher commitment from both researchers and practitioners. Not insignificant are the risks to researchers operating in difficult conditions with threats to their safety and security. It is

unsurprising, therefore, that methods used in humanitarian logistics research have been more 'hands off' and less collaborative.

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Table 1: Challenges of collaborative research in humanitarian settings

Challenges of academic-practitioner collaborative humanitarian aid research	**Sources**
Inconsistency of data and knowledge quality between different observers	Jahre et al. (2012); Kieser and Leiner (2009; Kieser and Leiner (2012); Hamet and Michel (2018)
Assuring safety and security of researchers in the field	Sundel (1999); Jahre et al. (2012); van den Muijsenbergh (2016); Tanabe et al. (2018); Sohn (2018); Lykes and Scheib (2016)
Coordination, linguistic and communication barriers including varied technical terminology	Lykes (2013); Pedraza-Martinez et al. (2013); Tanabe et al., (2015), van den Muijsenbergh (2016); Tanabe et al. (2018); Kieser and Leiner (2009); Kunz et al (2017)
Reflective longer-term collaborative research is time consuming and most HLSCM research focuses on urgent supply	Pedraza-Martinez et al. (2013); Jahre et al. (2015); Sohn (2018)
Remoteness of many humanitarian aid locations	Rutta et al., 2005; Nelson et al., 2010; Pedraza-Martinez et al., 2013; Prasad et al., 2017
Damaged infrastructure impedes research	Rutta et al. (2005); Nelson et al. (2010); Jahre et al. (2012); Pedraza-Martinez et al. (2013); Prasad et al. (2017), Sohn (2018); Tanabe et al. (2018)
Highly contextualised research impedes generalisability of findings	Touboulic and Walker (2016)

Table 2: Benefits of academic-practitioner collaborative research in humanitarian settings

Benefits of academic-practitioner collaborative research in humanitarian settings	**Source**
Better contextualisation of provided solutions	Pedraza-Martinez et al. (2013); Jahre et al. (2015); Sohn (2018).
Collection of richer and 'better data'	Pedraza-Martinez et al., (2013)
Provision of evidence-based insights, and improved planning of future response	Sohn (2018)
Enhanced information exchange and stronger supply chain competence	Jahre et al. (2012)
Bridging the gap between academic and practitioners' terminology and perceptions on the humanitarian domain, enhancing trust and engagement and solving real-life problems	Pedraza-Martinez et al. (2013); Refstie and Brun (2011)
Bridging the relevance gap between humanitarian logistics practitioners and academics	Kunz et al (2017)

Table 3. Collaborative research process for humanitarian supply chain research

Collaborative Project Phases	Collaborative Research Features/Elements	Contributions*
1. Form a collaborative research team of humanitarian logistics practitioners and academics	Forming a research project team with membership inclusive of different involved humanitarian stakeholders	*Coughlan and Coghlan, (2002); Canterino et al., (2016);* Sabri (2018); Pedraza-Martinez et al., (2013); Sundel (1999); Chang et al. (2010); Jahre et al. (2015); Rutta et al., (2005); Tanabe et al., (2015); Lykes and Scheib (2016); Manikas et al. (2017).
	Co-identification of the rationale and scope of the research project	*Coughlan and Coghlan (2002); Näslund et al., (2010); Shani et al. (2004); Canterino et al., (2016);* Sabri (2018); Jahre et al. (2012); Sohn (2018); Pedraza-Martinez et al., (2013); Sandvik and Lemaitre (2013); Refstie and Brun (2011); Jahre et al. (2015); Manikas et al. (2017).
	Co-identification of a preliminary research question and deciding on the unit of analysis	*Coughlan and Coghlan (2002); Näslund et al., (2010); Shani et al. (2004);* Sabri (2018); Jahre et al. (2012); Jahre et al. (2015).
2. Understand the humanitarian logistics research problem context and purpose	Researchers are immersed, embedded in the humanitarian field, and have access to the practitioner's system	*Coughlan and Coghlan (2002); Näslund et al., (2010); Shani et al. (2004);* Sabri (2018); Jahre et al. (2012); Sohn (2018); Pedraza-Martinez et al., (2013); Sundel (1999); Refstie and Brun (2011); Jahre et al. (2015); Chang et al. (2010); Prasad et al. (2017); Chandes and Pache (2010); Rutta et al., (2005); Tanabe et al., (2015); Lykes (2013); Lykes and Scheib (2016).
	To ensure rigour, involving a non-participatory researcher to monitor and observe the rigour of the entire research process	*Coughlan and Coghlan (2002); Näslund et al., (2010).*
	Understanding what are the economic/political/social/technical motivations behind this research	*Coughlan and Coghlan (2002); Canterino et al., (2016); Näslund et al., (2010); Shani et al. (2004);* Sabri (2018).
	Understanding the context of the humanitarian 'field' (e.g., geo-political dynamics, infrastructure state, safety and security situation, level of remoteness and rurality, and linguistic requirements), so as to prepare the needed practical accommodations	Sohn (2018); Jahre et al. (2012); Jahre et al. (2015); Sandvik and Lemaitre (2013); Refstie and Brun (2011); Sundel (1999).

3. Data Collection (by humanitarian logistics and supply chain researchers)	Triangulation of research methods (e.g., combining interviews, focus groups and questionnaire/survey)	*Näslund et al., (2010);* Sabri (2018).
	Triangulation of data collection from multiple sources (e.g., practitioners documents and website, respondents from the affected communities, archival data, legal proceedings and court report)	*Näslund et al., (2010);* Sabri (2018); Jahre et al. (2012); Sandvik and Lemaitre (2013); Sundel (1999); Chang et al. (2010); Jahre et al. (2015); Chandes and Pache (2010); Rutta et al., (2005); Nelson et al., (2010); Lykes (2013); Lykes and Scheib (2016).
	Collecting qualitative (e.g., observations, focus group discussions) and/or quantitative (e.g., surveys) data	*Coughlan and Coghlan (2002); Näslund et al., (2010);* Sabri (2018); Pedraza-Martinez et al., (2013); Sandvik and Lemaitre (2013); Sundel (1999); Rutta et al., (2005); Nelson et al., (2010).
	Collecting data in formal (meetings, interviews, questionnaires) and informal settings (coffee breaks, lunch)	*Coughlan and Coghlan (2002); Näslund et al., (2010);* Sabri (2018); Sohn (2018); Pedraza-Martinez et al., (2013); Sandvik and Lemaitre (2013); Sundel (1999); Chandes and Pache (2010); Lykes (2013); Lykes and Scheib (2016).
	Potential reflective sessions to discuss and update data collection techniques	*Coughlan and Coghlan (2002); Canterino et al., (2016); Näslund et al., (2010); Shani et al. (2004);* Sabri (2018); Sohn (2018); Pedraza-Martinez et al., (2013); Sandvik and Lemaitre (2013); Refstie and Brun (2011); Chang et al. (2010); Tanabe et al., (2015); Tanabe et al., (2018).
	Although most of the studies data was collected by the entire team, but we still recommend data to be mainly collected by researchers to ensure integrity and rigour.	*Coughlan and Coghlan (2002); Canterino et al., (2016); Näslund et al., (2010); Shani et al. (2004);* Sabri (2018); Sohn (2018); Jahre et al. (2012); Jahre et al. (2015); Chandes and Pache (2010); Pedraza-Martinez et al., (2013); Sundel (1999).
	Obtaining informant consent in the case data is directly collected from affected population respondents	Tanabe et al., (2018); van den Muijsenbergh (2016); Lykes and Scheib (2016).
4. Practitioner Orientation	Practitioners to be briefed on research tools and methods	*Coughlan and Coghlan (2002); Näslund et al., (2010);* Sabri (2018); Sohn (2018); Jahre et al. (2012); Jahre et al. (2015); Pedraza-Martinez et al., (2013); Sundel (1999).
	Researchers to prepare and present preliminary analyses (preliminary coding, technical reports and synthesising of group discussions)	*Coughlan and Coghlan (2002); Näslund et al., (2010);* Sabri (2018); Sohn (2018); Pedraza-Martinez et al., (2013); Sundel

		(1999); Sandvik and Lemaitre (2013); Chang et al. (2010); Tanabe et al., (2018).
	The structured data is communicated to the research team and to the practitioner's personnel	*Coughlan and Coghlan (2002); Näslund et al., (2010);* Sabri (2018); Sohn (2018); Pedraza-Martinez et al., (2013); Sundel (1999); Sandvik and Lemaitre (2013); Chang et al. (2010); Tanabe et al., (2018).
5. Collaborative Data Analysis	Identifying analysis tools and techniques by researchers	*Coughlan and Coghlan (2002); Näslund et al., (2010);* Sabri (2018).
	Data is collaboratively analysed by researchers and practitioners (and other involved stakeholders)	*Coughlan and Coghlan (2002); Näslund et al., (2010);* Sabri (2018); Jahre et al. (2012); Sandvik and Lemaitre (2013); Sundel (1999); Refstie and Brun (2011); Tanabe et al., (2015); Tanabe et al., (2018); Lykes and Scheib (2016).
	Triangulation of researchers in the analysis phase	All
	Establishing a logical chain of evidence by researchers	All
6. Joint Planning for Action	Co-identification of what needs to change, and strategies and practices for change management	*Coughlan and Coghlan (2002); Näslund et al., (2010);* Sabri (2018); Jahre et al. (2012); Sandvik and Lemaitre (2013); Sundel (1999); Chandes and Pache (2010).
	Co-developing of recommendations and intervention plans	*Coughlan and Coghlan (2002); Näslund et al., (2010);* Sabri (2018); Pedraza-Martinez et al., (2013); Sandvik and Lemaitre (2013); Refstie and Brun (2011); Chang et al. (2010); Jahre et al. (2015); Chandes and Pache (2010); Tanabe et al., (2015); Tanabe et al., (2018); Lykes and Scheib (2016); Manikas et al. (2017).
7. Implementation by humanitarian logistics practitioners with review and evaluation supported by researchers	Practitioners to execute the intervention plan (or to facilitate the implementation with local authorities in the humanitarian field)	*Coughlan and Coghlan (2002); Näslund et al., (2010);* Sabri (2018); Pedraza-Martinez et al., (2013); Jahre et al. (2012); Jahre et al. (2015); Chang et al. (2010); Chandes and Pache (2010); Tanabe et al., (2015); Tanabe et al., (2018); Manikas et al. (2017).
	Researchers to ensure the applicability, re-applicability and transferability conditions are met	*Coughlan and Coghlan (2002); Näslund et al., (2010);* Sabri (2018); Pedraza-Martinez et al., (2013); Jahre et al. (2012);

		Chang et al. (2010);); Jahre et al. (2015); Chandes and Pache (2010).
	The impact of the implementation to be co-evaluated and co-reviewed by researchers and practitioners	*Coughlan and Coghlan (2002); Näslund et al., (2010);* Sabri (2018).
	Joint reflective sessions and co-planning for future action cycles (if needed). That includes continuous refinement of the proposed solutions.	*Coughlan and Coghlan (2002); Canterino et al., (2016); Näslund et al., (2010); Shani et al. (2004);* Sabri (2018); Sohn (2018); Pedraza-Martinez et al., (2013); Sandvik and Lemaitre (2013); Refstie and Brun (2011); Chang et al. (2010); Tanabe et al., (2015); Tanabe et al., (2018).
8. Monitoring of the research by the non-participatory researcher	Monitoring is a meta-step in this framework, it can be facilitated by recruiting a non-participatory researcher who accompanies the research team in all the phases and observes the consistency of the research process and the active participation of all the involved actors. Part of the monitoring can be to ensure rigour conditions are met for any methodology used (e.g. developing a protocol for data collection, ensuring ethical participation and informant consent, sharing interview protocol with respondents, developing case study protocol)	*Coughlan and Coghlan (2002); Näslund et al., (2010);* Sabri (2018).

- We use the term 'Humanitarian Field' to refer to the location where the collaborative research process takes place, which also includes the local premises of humanitarian organisations in the affected locations.
- The term 'Researchers' in the framework mainly refers to university-based scholars or academic researchers

* Sources in *italic* come from supply chain, operations management and organisational management domain. The others are from humanitarian domain.

Table 4 - Rigour, relevance, and reflectiveness criteria in the present case study

Criteria *(from Sabri, 2018)*	**Mechanisms used in the presented case**
Rigour	
Understanding of underlying mechanisms of phenomena' "how things work"	Assured through: - Comprehensive literature review - Survey of organizational reports - An orientation visit of the research team to the HO at the beginning of the project
Researchers to be involved in the research process; not just observing	The researchers were a part of the CRM team and were directly involved in decision-making and devising action steps regarding the environmental sustainability of the HO
Hypothesis testing and research reproducibility, highlighting the role of 'context'	-The role of humanitarian context was highlighted through developing sustainable action steps that considered humanitarian specificities. -The research case was qualitative in nature and did not include hypothesis testing.
Objective review with other scientists	- The manuscript was reviewed by each of the authors individually. - The description of the case was sent to and confirmed by the sustainable development department of the HO.
Analysis and deeper interpretation for causality	At each joint meeting, the causes for unsustainable operations were discussed and their roots assigned to specific categories (e.g. donors, delegations, national governments regulations). This facilitated the subsequent solution-finding step.
To be publishable	The peer-review process and publication in the *Journal of Humanitarian Logistics and Supply Chain Management* confirms the publishability of results.
Triangulation of methodologies	Different sources of data were used for triangulation of data: - Interviews with staff at the HO - Review of organizational reports and website - Remote access of researchers to organizational databases - Field observations - Interviews of field staff with beneficiaries - Questionnaires and interviews with suppliers Within CRM methodology, other methodologies such as environmental impact assessment were deployed.
Reflectiveness	
To achieve social impact and theoretical significance	- Social impact: The impact was ensured through implementation of sustainable solutions in the field. A notable social impact was creating jobs for plastic waste collectors. - Theoretical significance: The research question was derived from literature review and theoretical foundations.
Greater knowledge of other scientists work	All the researchers involved in the research team had practical experience as well as sufficient understanding of other scholars' works due to their academic background in the fields of supply chain management and sustainability.
Longitudinal studies	The collaboration reported in this paper lasted about 19 months and it is still ongoing at the time of manuscript preparation including follow-up observations for packaging and collaboration for other products.
Collaboration with other researchers	The members of the research team were researchers who were internally collaborating to produce sustainable recommendations regarding the case to be discussed with the practitioner team. Moreover, the results were reviewed by external researchers who were not a part of the CRM team.

Creating a community of scientists to share ideas and evaluate preliminary results	Earlier versions of the work were presented in international conferences and the preliminary findings were discussed and evaluated by external researchers.
Applicable research analyses over longer period of time and within multiple settings	- The research team had already been involved in a collaboration project with similar goals about sustainability with a United Nations agency and some of the findings from that project was helpful and applicable in the project reported in this paper. - The presented research is ongoing and has shown to be applicable to other products of the same HO.
Relevance	
To achieve practical significance against costs incurred in conducting research	The costs invested on purchasing the incinerator and increasing waste collection points led to significant tangible improvements in the waste management of the refugee camp.
Has impact on organisation's performance (or the practitioner system)	As continuum of the cradle-to-grave environmental impact assessment, a similar assessment is being conducted for the current waste management system in the camp. The preliminary results suggest significant improvement in terms of environmental performance compared to the previous situation.
Having a realistic view on the resources constraints (money+time) against findings	The project reported here was conducted as a pilot project initially planned for one year. The CRM team envisioned pragmatic expectations at the start of the project which were achieved by the end, although the project took several months more than initial planning.
Avoiding oversimplification or overcomplicating	Through the cyclic approach of CRM, corrective measures were taken. For example, not accounting for the waste collection points and their average distance from beneficiaries was an oversimplification in the first cycle which was addressed in the second cycle.

Table 5. Expected versus actual implications of applying CRM in humanitarian supply chains

Humanitarian Activity	Expected Implications of Implementing CRM *(see Sabri, 2018)*	Implications from the present Collaborative Research Case Study
Logistics Management	Provides deeper involvement of researchers in the deployment process as well as in the allocation of resources.	Full improvement of the logistics process at the affected location and the packaging process starting from the supplier side.
Stakeholders Management	Establishing high levels of trust among different stakeholders, which helps in planning for long-term agreements and partnerships.	The collaboration granted the research team full access to rich and high-quality data for over 2 years. The positive evaluation of the implementation has improved the trust levels. Greater supplier involvement was detected.
Post-disaster Management	Improving back-office preparedness and front-office response to disasters and post-disaster events.	No evidence.
Donations Management	A better analysis and improving of critical needs forecasting values, and better demand sensing.	No evidence.
Affected Location Management	Overcoming issues of communication and lack of coordination of different stakeholders.	Increased awareness and inclusion.

Source	Collaborative Research Actors	Collaboration Context/ Project Description	Location	Duration of collaboration	Collaborative Research Methodology	Data Collection	Data Analysis	Methodological and/or Contextual Challenges	Benefits of Collaborative Research in Humanitarian Settings	Main Features of Collaborative Research
Jahre et al. (2012)	academia-practitioner	A project between academics and UNICEF Uganda and The Global Emergency Group on drug-supply chains in Uganda, analysing the causes and possible solutions to frequent stock shortages.	Uganda	2009-2010	Action Research embedded in a case study	50 interviews and 27 site visit, interview protocols and guides were prepared and then refined during the process. Snowball sampling starting with a small group of people suggested by UNICEF	Interviews were performed by two researchers, one participatory and the second is observing. One is a humanitarian logistics practitioner and the other is a logistics researcher. Cross-referencing data by using various sources. The analyses were discussed with the stakeholders and recommendations for improvements were suggested.	*The field context was challenging, with 5,000 km at a speed of 30 km per hour on dirt roads, wearing bulletproof vests, and helmets (Jahre, 2010).* Lack of control over data quality Absence of key variables Inter-observer consistency: is the measure consistent between observers Face validity - does the measure reflect the concept in question External validity: can results be generalized	better forecasting and inventory management through integration of the supply chain, reducing complexity by eliminating stocks, and providing better information exchange and stronger supply-chain competence	1- co-identification of project scope 2- data triangulation in formal and informal settings 3-no formal practitioner orientation 4-collaborative analysis of data, triangulation of researchers 5-co-developing of intervention plans 6- practitioners execute the intervention plans 7- Monitoring (observant researcher)

Sohn (2018)	academia-practitioner	A project between academics and Zambia Meteorological Department on the use of weather information and early warning systems for humanitarian supply chains.	Zambia	2 years	Field research embedded in a case study	the project was part of bigger project which has ensure accessibility to rich data. There was a pre-determined scope of the research and geographical range. Site visits facilitated by the practitioners.	Interviews, field notes, organisational reports, and other relevant. secondary data were reviewed and analysed. Soon after the field visit, the author was required to compile a report on the project. The report consisted of preliminary findings from the field that were mainly based on the author's memories and field notes.	1- Safety and security issues in the field, geographical dispersion lead to a limited academic engagement. 2- The 'immediate response' short time window doesn't allow researchers to embark on collaborative research projects (most HLSCM research focuses on immediate response) 3- Field research is time consuming	1- providing evidence-based insights and to better plan the future response in practice. 2- Maximising the contextuality and relevance to the real-life situation.	1- Understanding the context and geo-political situation in Zambia beforehand commencing the research 2- Co-identification of the research with Zambia metrological department 3 - Data collection in formal (e.g. interviews with guides) and informal settings (e.g. over lunch) 4- Focusing on the end-user of the metrological data (i.e. social impact and reflexivity) 5- Researcher prepared interview guides and updated it with preliminary analysis, before each interview the practitioners received minimal orientation. 6- Researcher had access to rich data from the Zambia Meteorological Department 7- Continuous re-assessment of the applied methodology and collected data to establish a logical chain or evidence. 8- Continuous refinement of the proposed solutions (frameworks) based on a continuous reflection on the findings. 9- the researcher collected the data

Pedraza-Martinez et al., (2013)	academia-practitioner	A long-term collaborative project between academics and several international humanitarian organisations (UNCHR, ICRC, IFRC, WFP and WVI) International Committee of the Red Cross (ICRC); the International Federation of Red Cross and Red Crescent Societies (IFRC); the World Food Programme (WFP); and WorldVision International (WVI).	various countries (Kenya, Mozambique, Uganda...among others)	2007 till past 2013	Field work embedded in a case study (case study as per the authors). Long term *prescriptive* and collaborative research using optimisation models.	1- qualitative and quantitative data2- Interviews with staff, field trips, and archival quantitative data on vehicle use	statistical analysis for quantitative and archival data. Not mentioned for qualitative data	The language used by academics is different than that of practitioners, leading to distorted evidence and a challenging sense-making of the data.2- Remoteness and rurality of the 'field'	1- Maximising contextualization 2- Higher practitioner-academic engagement leads to collecting richer and 'better data'. 3- The continuous reflection enabled the academics to ask more sophisticated questions and to perform deeper analyses, hence; solving real-life problems with significant societal impact on the local communities4- Building a relationship by the way of enhancing trust and engagement. Moving from *'the academics Team'* to trusted partners.5- bridging the gap between academic and practitioners terminology and perceptions on the humanitarian domain	1- Academic team was immersed in the practitioner system (i.e. Field), closely working together and building trust over the years2 - The research problem (hence, question) evolved during field visits and was co-identified by the wat of discussion with practitioners.3- A team was formed by academics with extensive engagement from the ICRC staff4- data triangulation from different sources (primary interviews and secondary archival), also quantitative and qualitative5- the academic team collected the data, the practitioners facilitated access to personnel and archives due to high level of trust6- preliminary analysis was performed (exploratory phase) and the practitioners system was continuously updated7- triangulation of methods (statistical analysis and qualitative analysis) and triangulation of researchers from different universities.8- Recommendations (prescriptions) were developed and some of the were implemented, and evaluated.

Sandvik and Lemaitre (2013)	academia-practitioner-affected population	a collaborative research project between academics and a local NGO in Colombia that caters for internally displaced women 'Liga de Mujeres Desplazadas'.	Colombia	May 2010 - June 2011	Field research embedded in a case study. And a Survey	Qualitative and quantitative methods, Interviews with 14 Liga leaders; a collaboratively developed census of 126 member households (end beneficiaries). Ethnographic observation, and participation with a collaborative approach. extensive field notes from participant observation of legal proceedings and meetings; and interviews, audio clips, and statements obtained from the Liga's three successive websites	Qualitative analysis of interviews. Statistical analysis of the survey Content analysis of legal documents and court reports	Legal and juridical challenges related to the situation of internally displace communities, especially women.	Co-creation of knowledge between academia and practitioners has led to a plethora of benefits to the end beneficiaries. They managed to improve the national legal and administrative framework to recognise the rights od IDP and receive better services from the local authorities. The co-created knowledge has also led international humanitarian organisations (WFP) to be more engaged in the situation and increase the food aid. 2- Proposing local beneficiaries of humanitarian aid as agents in the production and management of knowledge, rather than just aid recipients. *′ knowledge is, in fact, power′* (p.S46)	1- The research team made sure to establish a very deep understanding of the context of the north Colombian region, the geo-political situation, the legal and administrative frameworks and the jurisdicial situation of internally displaced people 2- the research objective and the methodology (survey) were co-developed with the Liga research committee 3- data gathered in formal (interviews, survey, websites) and informal settings (field trips and observations) 4- Triangulation of data sources (primary from interviews, survey responses and legal meetings) and secondary (Liga website, legal proceedings, court reports) 5 - Triangulation of methods (in-depth interviews, survey, field observations and ethnography) 6- the Liga team received orientation on initial data analysis and an initial report was presented to them 7- the methodology was amended after reflection session on the exploratory analysis

										(trial runs of the census) 7- The Liga team helped in the data interpretation
Sundel (1999)	academia-practitioner	contracted collaborative research between academics and the UNHCR (United Nations High Commissioner for Refugees).	Cyprus/Northern Cyprus	not mentioned	Field research embedded in a case study. And a focus group (workshop)	Qualitative and quantitative methods, preliminary meetings, survey, in-depth interviews, site visits, workshops and focus groups	not mentioned	security issues reluctance of local communities to collaborate with research team	building a relationship between two segregated local communities	1- Research is imitated by a practitioner, research problem is based on a critical real life situation in Cyprus and Northern Cyprus, and caters for the needs of local communities to have a mental health facility that can be shared between the two segregated communities due to a political conflict. 2- Deep involvement of the two researchers, where one of them was recruited as a consultant by practitioners 3- Data gathered from different sources and in different formats. Further, in formal and informal settings 4- Practitioners and participants from local authorities contributed to the analysis 5- Triangulation of researchers 6- co-identification of potential solutions.

Refstie and Brun (2011)	academia-practitioner-affected population	A collaborative research project between academics, a national NGO and forced migrants in Uganda.	Uganda	started in 2007	Participatory Action Research	Interviews with key officials from NGOs and local and national government. In addition, individual interviews, focus group discussions, and observation.	qualitative data analysis (implicit)	not mentioned	bringing together researchers, practitioners, local NGOs, local authorities, and local communities to solve real-life problems, provide humanitarian aid and to co-create knowledge and provide advocacy on the status of internally displaced people.	1- transformative participatory research that uses knowledge creation to better direct policy making and improve a real-life situation2- the collaborative research is co-developed by academics and practitioners with involvement of local communities and policymakers.3- jointly preparing for action (briefing papers)4- The collaborative nature of the project gave participants an opportunity to be more than just a source of information. 5 - involvement of the participants in initial findings analysis in focus groups, hence jointly planning for required action

Prasad et al. (2017)	academia-practitioner	action research project between academics and Sodhana Charitable Trust operating in rural Andhra Pradesh, India.	India	not mentio ned	Action Research	data collected on women's health from multiple age groups through a detailed instrument with over 100 questions.	simulation analysis	rurality and remoteness	improving the healthcare services in the rural villages of India. action research helped in having a more real-life simulation.	1- transformative participatory research, with a main goal to solve a real life challenge (improving health care in rural India). 2- A team of researchers and practitioners working closely together, with knowledge sharing and trust. 3- In **contrast** to our framework, data was collected by practitioners
Chang et al. (2010)	academia-practitioner	action research project between different Taiwanese universities and Taipei City Government in Taiwan.	Taiwan	3 years	Participatory Action Research	field observations, meetings, semi-structured in-depth interviews, focus groups, and an online discussion forum. Members of the research team volunteered as non-paid members in the NGO.	qualitative data analysis (implicit)		Accurate identification of the crucial needs and also new potential problems that need to be addressed in the Future.	1- Formation of a research committee that incorporates both researchers and practitioners to co-identify the scope of the collaborative research project 2- Triangulation of different sources of data 3- Reflective sessions 4- Briefing practitioners with preliminary analysis and joint data analysis 5- Cyclical rounds of intervention and implementation

Jahre et al. (2015)	academia-practitioner	action research project between academics and International Federation Red Cross Red Crescent (IFRC).	Haiti, Turkey and Ivory Coast	2010-2011	Action research - embedded in a case study settings	Field observations, field trips, in-depth interviews,	qualitative cross-case analysis for the three case studies by categorization and pattern matching.	Disseminating of results from action research projects in scientific journals is challenging, both because of time constraints and because the scientific community is sceptic about its rigor.	solving real life problems and building new knowledge.	1- co-identification of research problem and forming a research team with the IFRC 2- field visits to better understand the context 3- unit of analysis is not fixed and depends on the case context 4- triangulation of different data sources 5- case study protocol beforehand the research 6- researchers are immersed in the field and have access to IFRC systems 7- co-developing of intervention 8 - cyclical process with reflective sessions
Chandes and Pache (2010)	academia-practitioner	Collaborative research project between academics and Cooperation Logı´stica Solidaria, Lima, Peru	Peru	April 2007 - December 2008	Participant observationmethod.	interviews, archival data	qualitative data analysis (implicit)	not mentioned	The collaborative nature allowed a privileged position to the researchers in terms of data collection and providing rich data analysis	1- extensive social interaction between researchers and aid beneficiaries2 - Researchers immersed in the practitioner's system and managed to have complete access to data. As one of the researcher was working in the same government bureau where the data collection was taking place.3- Cyclical research (multi-phases). Researchers and practitioners are swapping roles

Rutta et al., (2005)	Practitioner-affected population	Collaborative research project between academics and the International Federation of the Red Cross (IFRC), UNHCR and Burundian and Rwandan refugees	Tanzania	2002-2003	Participatory field assessment	Interviews, focus groups and quantitative data	four groups of assessment teams, various qualitative methods (e.g. Content analysis)	[Implicit] issues related to refugee camps; rurality and remoteness, healthcare issues, security issues.	1- beneficiary-cantered approach to solve real-life problems. Inclusion of refugee community in research (data collection and analysis) and appraisal of humanitarian aid programmes 2- Accurate needs assessment and improving the living situation of refugees	1- A diverse team of non-academic researchers belonging to different organisation working closely together to develop the research problem. 2- The beneficiaries (i.e. refugees) participated in the research methodology (i.e. data collection and analysis) 3- triangulation of data sources and types (quantitative and qualitative)
Nelson et al., (2010)	academia-practitioner-affected population	Collaborative research project between academics, International Rescue Committee, Tanzania Program, and the aid beneficiaries	Tanzania, Kenya	not mentio ned	By-person factor analysis	interviews, focus group discussions and free-response questionnaires.	interviews, focus groups	[Implicit] issues related to refugee camps; rurality and remoteness, healthcare issues, security issues.	1- Overcoming lack of beneficiary involvement, hence, improvement of healthcare services for aid recipients 2- Accurate identification of the specific needs of beneficiary communities 3- spotting potential obstacles to improvements 4- improving refugee satisfaction	1 - triangulation of quantitative and qualitative methodologies 2- active involvement of multiple stakeholders in the research problem (academics, practitioners and beneficiaries)

Tanabe et al., (2015)	Practitioner-affected population	A participatory research project led by the omen's Refugee Commission and a number of local humanitarian aid NGOs	Kenya, Nepal, and Uganda	November–December 2013 (Kenya) December 2013–January 2014 (Uganda) August 2014 (Nepal)	Qualitative participatory methods	focus group discussions and interviews, using maximum variation principle	NVivo 10 and Excel	language barrier, thus translation services were procured for the different languages used by refugees	1- inclusion of refugees in research, hence, offering better healthcare services and improving the their rights.	1- formation of a multidisciplinary research team 2- Reflective sessions (daily debriefing meetings) 3- inclusion of different stakeholder 4- Triangulation of data sources 5- collaborative data analysis with all the stakeholders in discussion groups 6- intervention plans are co-developed with the research team
van den Muijsenbergh (2016)	academia-affected population	Editorial, guiding paper	n/a	n/a	Mixed quantitative-qualitative participatory action research	making sure of obtaining informed consent beforehand commencing the data collection	n/a	Safety, language barriers.	n/a	1- involvement of affected communities 2- participatory nature 3- triangulation of data sources 4- triangulation of methods
Lykes (2013)	academia-affected population	a participatory research project between academics and survivors directly affected by armed conflict in Guatemala and their families in the USA	Guatemala, USA	started in 1996	(Photo—) Participatory Action Research	Storytelling, community mapping, and collective drawings	documentation analysis	linguistic and ethnic barriers	Developing solidarity with survivors communities rebuilding the social network of those survivors and connecting them with their families	participatory nature, researcher is embedded in the field and the different stakeholders including the aid beneficiaries are included in the research

Tanabe et al. (2018)	Practitioner-affected population	a participatory action research project led by researchers from Women's Refugee Commission's Sexual and Reproductive Health Program and representatives from the e affected community	Kenya, Nepal, and Uganda	2013 - 2014	Participatory Action Research	focus group discussions and interviews, using maximum variation principle	Nvivo	1- Language barrier2- Limited accessibility due to damaged infrastructure3- Safety issues	1- Developing the relationship through the collaborative research process; enhancing collaboration and power sharing among the humanitarian stakeholders2- Identifying the priorities of each actor 3- Engaging the humanitarian aid recipient as participatory actors rather than respondents; hence, helping them overcome marginalisation. Strengthening the social network among the aid recipients.	1- cyclical, multi-phases research2- research findings inform different stakeholders (NGOs, UN agencies, local policymakers, and affected commuties)3- establishing a research team inclusive of representatives from different stakeholders4- developing a protocol for participant recruitment and obtaining informant consent for the entire duration of the research project5- Reflective sessions (debriefing the stakeholders of preliminary analysis, group discussions with participatory activities)6- planning for action by preparing customised technical reports in local languages to address different contexts.

Lykes and Scheib (2016)	academia-affected population	a collaborative research project between academics and Latinas and African-American women in the aftermath of hurricane Katerina in New Orleans	USA	2006 - 2009	(Photo—) Participatory Action Research	storytelling, visual techniques such as photo narratives	critical bifocal analysis	1- the participatory project was time consuming and required great deal of effort from the local communities 2- Law enforcement is not strong during and after disasters	1- enhancing self-confidence of the african-american and Latina women in the aftermath of hurricane Katerina	1- participatory nature 2- an engaged research team with diverse membership that includes university-based as well as community-based researchers 3- triangulation of different data sources and types 4- putting forward recommendation (prescriptions)
Manikas et al. (2017)	academia-practitioner	a collaborative research project between a group of academics and a humanitarian NGO (Idaho Foodbank).	USA	=	n/a	n/a	n/a	n/a	providing humanitarian organisations with low-cost software tools	1- engagement of researchers and practitioners in the design of a solution to real life problem