Using collaborative research methodologies in humanitarian supply chains

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Abstract

Purpose – The purpose of this paper 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/approach – Building on collaborative research methodology and humanitarian supply chain literature, the Sabri's (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, focussing on environmental sustainability improvement. The collaborative case analysis suggests a number of refinements to the elements of the process. This study undertook two cycles of academia–practitioner collaborative research.
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 paper 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, and then it is applied in a humanitarian logistics case focussed on environmental sustainability. The present collaborative research process facilitates engaged scholarship among the humanitarian stakeholders, as the researchers' roles move from observatory to participatory knowledge broker.

Keywords Sustainability, Humanitarian logistics, Humanitarian supply chain, Action research, Collaborative research

Paper type Research paper

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 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

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(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, even though "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 works 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 practitioners, if they continue 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 and Gold, 2017; Sohn, 2018), which has increased interest in the use of research methods that might help close this gap. Collaborative research methods (CRM) 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). Therefore, Engaged scholarship as "[…] 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, 2006, p. 803) 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 to a humanitarian logistics problem. The collaborative research methodology process presented here builds 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 experience reported in prior literature (see e.g. Chandes and Paché, 2010; Jahre *et al.*, 2012, 2015; Pedraza-Martinez *et al.*, 2013; Prasad *et al.*, 2017). Through analysis of 17 collaborative research projects in the broader humanitarian setting, themes from these projects 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 *et al.* (2012), Haavisto and Kovács (2014), Abrahams (2014) and Kunz and Gold (2017) call for more research on this topic in humanitarian logistics research, highlighting that as humanitarian operations increase globally, so does the environmental burden caused by them. The attention of scholars in the humanitarian arena has largely been, to date, directed to disaster relief, focussing 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 paper 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 paper and summarises 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; however, it has entered 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, and 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 (MacLean *et al.*, 2002; Van de Ven and Johnson, 2006). For management research to be termed collaborative, two parties or more need to be involved in the knowledge co-creation process, of which 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). The 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).

2.1 Types of collaborative research methodologies

Shani *et al.* (2004) identified eight types of collaborative research methodologies: 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 lead 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).

2.2 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 and Van Wassenhove (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 identified use of a type of collaborative research; in the Appendix, 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 (HOs). 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 paper 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 I.

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

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 humanitarian field experience reported in a number of collaborative research projects (see e.g. Chandes and Paché, 2010; Jahre *et al.*, 2012, 2015; Pedraza-Martinez *et al.*, 2013; Prasad *et al.*, 2017, and Appendix). 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 CRM processes, this research method process starts by forming a collaborative team, understanding the research problem's context and purpose, then proceeding to data collection, practitioners' orientation, collaborative data analysis, joint planning for action, implementation and evaluation and ongoing monitoring (Table III).

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 e.g. Eng-Larsson and Vega, 2011; Sarkis *et al.*, 2012; Haavisto and Kovács, 2014; Abrahams, 2014; 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

Table I. 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 (2012), Hamet and Michel (2018)
Assuring safety and security of researchers in the field	Sundel (1999), Jahre *et al.* (2012), van den Muijsenbergh *et al.* (2016), Tanabe *et al.* (2018), Sohn (2018), Lykes and Scheib (2016)
Coordination, linguistic and communication barriers including varied technical terminologies	Lykes (2013), Pedraza-Martinez *et al.* (2013), Tanabe *et al.* (2015, 2018), van den Muijsenbergh *et al.* (2016), Kunz and Gold (2017)
Reflective long-term collaborative research is time consuming, and most HLSCM research works focus 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 II. Benefits of academic–practitioner collaborative research in humanitarian settings

	Sources
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 and Gold (2017)

Table III.
Collaborative research process for humanitarian supply chain research

Collaborative project phases	Collaborative research features/elements	Contributions[a]
1. Forming 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)
2. Understanding the context and purpose of humanitarian logistics research problem	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, 2015), Sohn (2018), Pedraza-Martinez *et al.* (2013), Sandvik and Lemaitre (2013), Refstie and Brun (2011), 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, 2015)
	Researchers are immersed, embedded in the humanitarian field, and they 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, 2015), Sohn (2018), Pedraza-Martinez *et al.* (2013), Sundel (1999), Refstie and Brun (2011), Chang *et al.* (2010), Prasad *et al.* (2017), Chandes and Paché (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, 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, 2015), Sandvik and Lemaitre (2013), Sundel (1999), Chang *et al.* (2010), Chandes and Paché (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)

(*continued*)

Table III.

Collaborative project phases	Collaborative research features/elements	Contributions[a]
	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 Paché (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, 2018)
	Although most of the studies data were 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, 2015), Chandes and Paché (2010), Pedraza-Martinez *et al.* (2013), Sundel (1999)
	Obtaining informant consent in the case data are directly collected from affected population respondents	Tanabe *et al.* (2018), van den Muijsenbergh *et al.* (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, 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 are 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 are 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, 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 Paché (2010)

(*continued*)

Table III.

Collaborative project phases	Collaborative research features/elements	Contributions[a]
	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 Paché (2010), Tanabe *et al.* (2015, 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, 2015), Chang *et al.* (2010), Chandes and Paché (2010), Tanabe *et al.* (2015, 2018), Manikas *et al.* (2017)
	Researchers to ensure that 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, 2015), Chang *et al.* (2010), Chandes and Paché (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), which include 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, 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	*Coughlan and Coghlan (2002)*, *Näslund et al. (2010)*, Sabri (2018)
	Part of the monitoring can be to ensure that 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)	

Notes: 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. [a]Sources in italic come from supply chain, operations management and organisational management domain. The others are from humanitarian domain

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 contextualised green practices that fit the specificities of humanitarian logistics. Hence, the researchers were driven by the following research question:

RQ1. 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 focussed on collaborative research between an academic partner and a large international HO. The HO is headquartered in a developed country with many regional and national delegations around the world. Its purpose is to help populations affected by natural disasters and armed conflicts by providing food and shelter. This collaborative research focusses on improving environmental sustainability of the HO's operations in its supply chains.

Although 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 works (Sohrabpour *et al.*, 2012; Regattieri *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 *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 unsustainable operations were identified, focussing 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 cycle.

Forming the collaboration team. In total, three large HOs 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 HOs 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 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. On this basis, the main responsibilities of the practitioner team were providing access for the researchers to organisational 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 min 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 on the basis of 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 as well as the potential solutions to address those concerns. All the interviews were audiorecorded 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 organisational data whenever there were ambiguities. Although 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 meetings were held in the headquarters; more interviews were conducted with the HO staff. Following perceived success in the first cycle, the HOs 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 contextualisation of practices for the collected data. Specifically, humanitarian factors that might impact on implementation of sustainable practices were jointly analysed. The joint discussion led to a shared understanding of the issue before proceeding to co-develop action steps (Shani *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 as well as suppliers. In this cycle, the CRM team focussed on collaborative sensemaking 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 should focus on the design of packaging for food ingredients since changing medical products' packaging was more difficult due to medical regulations and high standardisation.

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 focussed 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 on the basis of the research question while they captured the inherent characteristics of the HO'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, whose results 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. The choice of organisational partner was critical before attempting to commence collaborative research. As academic access to corporate elites to conduct research is challenging (Welch *et al.*, 2002), it is an unusual situation for academics 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: as field staff members 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 e.g. 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 first cycle were reviewed at the beginning of second cycle 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. Therefore, in the second cycle, the attention of the CRM team turned towards collecting data from suppliers. Three major suppliers of food ingredients 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 and evaluation of outcomes, and proposed corrective measures to improve sustainability.

Collaborative data analysis. In the analysis, the practitioner team dismissed some of the proposals because it 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. Although this practice is used in commercial supply chains, using it in humanitarian supply chains is more difficult 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 was not previously aware of this problem. The existing waste collection points and bins were designed by the HO several years back 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 to tackle the disposal of waste. First, the CRM team proposed to raise beneficiaries' (refugees receiving food) awareness about the 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 benefits in addition to environmental gains. The third action focussed 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 focussed 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. Efforts on reverse logistics planning were greatly improved, minimising 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 organisations (Shani *et al.*, 2018).

Local staff members 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 that could be easily recycled or reused. The instructions mandated that at least two permanent, non-volunteer staff members 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.

Before starting the project, 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-month period, implementation revisions and tweaking were required, but broadly, the implementation phase was 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 were revised to include instructions on proper disposal. The reduction of plastic and the use of greener substitutes were ongoing but being achieved gradually.

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

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 organisational 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* confirm 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 organisational reports and website Remote access of researchers to organisational 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

Table IV.
Rigour, relevance and reflectiveness criteria in the present case study

(*continued*)

Criteria (from Sabri, 2018)	Mechanisms used in the presented case
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 were 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. Although the CRM team envisioned pragmatic expectations at the start of the project, which were achieved by the end, 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 that was addressed in the second cycle

Table IV.

5. Discussion

The inclusive nature of collaborative research impacted suppliers, affected populations, local humanitarian workers, the international HO 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 were observed, improving management across the stakeholders in this complex network of actors.

In contrast to propositions of previous studies (cf. Sabri, 2018), as depicted in Table V, 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 in the packaging design and process at suppliers were substantially enhanced. Awareness of the affected population had noticeably increased, leading to improved social inclusion in the efforts. Implementation of the CRM process, contextualised for humanitarian supply chains, was viewed as successful.

However, several challenges of using collaborative research methodologies were encountered in this research. First, forming the team took substantial time and effort to engage HOs and negotiate the nature of the 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.

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 being interviewed and engaged in observational research. This may be because of lack of trust in the

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 almost 2 years. The positive evaluation of the implementation has improved the trust levels A 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

Table V.
Expected vs actual implications of applying CRM in humanitarian supply chains

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. After this research, the HO actively pursued further discussions for future collaborative research.

Tweaks and changes to the CRM 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 the 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 CRM.

In the data collection and data analysis phases, there was no manipulation by the management team as its genuine intent was to solve the issue from its root causes; as such, it provided 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 the following:

- unpredicted factors that impact action plans, such as budget restrictions;
- frequent movement of employees in HOs, making it difficult to maintain a long-term collaboration; and
- 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 CRM process. This project suffered from the lack of funding, so persuading a third-party researcher to engage without funding proved unsuccessful. Triangulation of methodologies and

engagement of external inter-disciplinary researchers are very challenging in practice; planning more in advance for this might help, but there is no simple solution for conducting collaborative research in highly resource-constrained settings, such as humanitarian supply chains.

Although this research used academic–practitioner collaboration in the CRM process, unexpectedly during application of the research process 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, highlighting the need for flexibility in use of CRM. The 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 members were already involved in the first cycle, as compared to implementation in other countries where field staff members 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, 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 and Wilkins, 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. The disclosure of action research results and reporting any shortcomings of practitioners in publications can impact the social image of the practitioner organisations.

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 timeline 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 the frequent rotation of humanitarian officers in the field, the practitioner orientation phase should include a step in which researchers should make sure that 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 HOs managers–field staff–researcher and even the "tetrad" of HO 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 members might be reluctant because they were not involved earlier.

6. Conclusions

6.1 Contribution to theory

The central thesis of this paper 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; Näslund, 2002; Näslund *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; Näslund *et al.*, 2010). This paper contributes a CRM 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 CRM 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 CRM; this collaboration led to a 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 in the humanitarian logistics field through further application of this new CRM process, and increasing collaboration with academia to solve problems in the field. A 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 that can be played by suppliers and logistics 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 long-term implications.

Engagement of locally affected populations (in what became a tetradic, or four party, collaboration of academics, HO managers, local field staff and affected populations) impacted 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 a substantial reduction in the problems of waste disposal.

It is likely that the long-term collaborative nature of this research and the implementation of the CRM process are 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 does not 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 CRM process provided here would enable more general understanding of the appropriateness of CRM. However, the resource intensity of using CRM 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 exacerbate complexity and resource demands on humanitarian logistics researchers. The nature of collaborative research entails higher commitment from both researchers and practitioners. The risks to researchers operating in difficult conditions with threats to their safety and security are not insignificant. It is unsurprising, therefore, that methods used in humanitarian logistics research have been more "hands off" and less collaborative.

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(The Appendix follows overleaf.)

Appendix

Table AI.
Review of collaborative research studies in the humanitarian domain

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 visits. 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) 1. Potential lack of control over data quality 2. Absence of key variables 3. Inter-observer consistency: how consistent is the measure consistent between different observers 4. Face validity: does the measure reflect the concept in question 5. 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 the scope of the project 2. Data triangulation in both 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)

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Table AI.

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
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 ensured accessibility to rich data There was a pre-determined scope of the research and geographical range Site visits facilitated by 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 which consisted of preliminary findings from the field that were mainly based on the author's memoing and field notes	1. Safety and security issues in the field, high levels of geographical dispersion have led to a limited academic engagement 2. The short time window of "immediate response" does not 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 conceptuality 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. The researcher prepared interview guides and updated them with preliminary analysis, before each interview practitioners received minimal orientation 6. The researcher

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Table AI.

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
										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: International Committee of the Red Cross (ICRC); the International	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	1. Qualitative and quantitative data 2. Interviews with staff, field trips and archival quantitative data on vehicle use	Statistical analysis for quantitative and archival data Not mentioned for qualitative data	1. 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	1. Maximising contextualization 2. Higher practitioner–academic engagement leads to collecting richer and "better data" 3. The continuous reflection enabled the	1. Academic team was immersed in the practitioner system (i.e. field), closely working together and building trust over the years 2. The research problem (hence, question) evolved during field visits and was

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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
		Federation of Red Cross and Red Crescent Societies (IFRC); the World Food Programme (WFP); and WorldVision International (WVI)			optimisation models			and rurality of the "field"	academics to ask more sophisticated questions and to perform deeper analyses; hence, solving real-life problems with significant societal impact on the local communities 4. Building a relationship by the way of enhancing trust and engagement. Moving from "the academics Team" to trusted partners 5. bridging the gap between terminologies used by academic and practitioners, and perceptions on the humanitarian domain	co-identified by the way of discussion with practitioners 3. A team was formed by academics with extensive engagement from the ICRC staff 4. Data triangulation from different sources (primary interviews and secondary archival), also quantitative and qualitative 5. The academic team collected the data, the practitioners facilitated access to personnel and archives due to high level of trust 6. Preliminary analysis was performed (exploratory phase) and the practitioners system was continuously updated

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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
										7. Triangulation of methods (statistical analysis and qualitative analysis) and triangulation of researchers from different universities 8. Recommendations (prescriptions) were developed and some of them 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	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	1. 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 of IDP and receive better services from the local authorities.	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 juridical situation of internally displaced people 2. The research objective and the methodology

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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
						approach extensive field notes from participant observation of legal proceedings and meetings Interviews, audio clips and statements obtained from the Liga's three successive websites			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)	(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

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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
										reflection session on the exploratory analysis (trial runs of the census) 8. The Liga team helped in the interpretation of data
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

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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
										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	1. Transformative participatory research that uses knowledge creation to better direct policy making and improve a real-life situation 2. The collaborative research is co-developed by academics and practitioners with involvement of local communities and policymakers

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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
									internally displaced people	3. Jointly preparing for action (briefing papers) 4. The collaborative nature of the project provided the participants with 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 mentioned	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

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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
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	our framework, data was collected by practitioners 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	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

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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
								and rigour concerns		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 Paché (2010)	Academia–practitioner	A collaborative research project between academics and Cooperation Logi stica Solidaria, Lima, Peru	Peru	April 2007–December 2008	Participant observation method	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 beneficiaries 2. The researchers were immersed in the practitioner's system and managed to have complete access to data. As one of the researchers was working in the same government

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Table AI.

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
										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	A 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 and 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	A collaborative research project between academics, International	Tanzania, Kenya	Not mentioned	By-person factor analysis	Interviews, focus group discussions and free-	Interviews, focus groups	(Implicit) issues related to refugee camps; rurality and remoteness,	1. Overcoming lack of beneficiary involvement, hence,	1. Triangulation of quantitative and qualitative methodologies 2. Active

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Table AI.

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
		Rescue Committee, Tanzania Program, and the aid beneficiaries				response questionnaires		healthcare issues, security issues	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	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 the research, hence, offering better healthcare services and improving 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

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Table AI.

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
										plans are co-developed with the research team
van den Muijsenbergh *et al.* (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 a group of researchers from Women's Refugee Commission's Sexual and Reproductive Health Program and	Kenya, Nepal, and Uganda	2013–2014	Participatory action research	Focus group discussions and interviews, using maximum variation principle	Nvivo	1. Language barrier 2. Limited accessibility due to damaged infrastructure 3. Safety issues	1. Developing the relationship through the collaborative research process; enhancing collaboration and power sharing among the humanitarian stakeholders 2. Identifying the	1. Cyclical, multi-phases research 2. Research findings inform different stakeholders (NGOs, UN agencies, local policymakers, and affected communities) 3. Establishing a

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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
		representatives from the affected community							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	research team inclusive of representatives from different stakeholders 4. Developing a protocol for participant recruitment and obtaining informant consent for the entire duration of the research project 5. Reflective sessions (debriefing the stakeholders of preliminary analysis, group discussions with participatory activities) 6. Planning for action by preparing customised

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Table AI.

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
										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

Table AI.