



## Article

# Identifying Challenges and Improvement Approaches for More Efficient Procurement Coordination in Relief Supply Chains

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**Abstract:** Coordinating humanitarian organizations in the procurement of urgently needed relief items is complex and characterized by decentralization and isolated decision-making. The decentralized coordination of associated tasks often results in the duplication of efforts and redundant/incorrect relief items supplies into single disaster regions, having negative impacts on the most vulnerable ones. This paper devotes attention to the challenges that exist in the coordination of procurement activities in relief supply chains and asks for improvement approaches to facilitate more efficient demand satisfaction in disaster situations. Therefore, the authors apply multiple case study research including expert interviews with procurement agents and heads of logistics from international non-governmental organizations (NGOs), humanitarian start-ups and military logistics centers. Results indicate that a lack of incentives to cooperate, poor communication, unclear division of competences and noncompliance to standards and regulations constitute substantial challenges in procurement coordination. Moreover, expert interview results show that social media integration, procurement flexibility, cluster and collaborative coordination have potential to support improving the coordination of NGOs' procurement activities. By presenting several theoretical propositions, this paper complements already existing literature and provides a reference point for future research. Practitioners can benefit from findings as they are provided with a guide that allows redesigning certain processes in procurement coordination.

**Keywords:** humanitarian logistics; relief supply chain management; procurement coordination; case study research



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## 1. Introduction

Statistics indicate that the total number of disasters has decreased over past decades, but they have been affecting more and more people as disaster-prone areas are increasingly populated [1]. In the years of 2005–2014 alone, the economic impact of disasters is estimated at \$1.4 billion, affecting more than 1.7 billion people and killing 0.7 million people worldwide [2]. In order to overcome disaster impacts, effective and efficient relief supply chain management (RSCM), including the procurement, transport and warehousing of relief items, is urgently needed [3]. Effectiveness and efficiency in RSCM are closely related to the performance of various stakeholders in coordinating procurement, transport and warehousing activities at high levels of cooperation and collaboration along the phases—mitigation, preparedness, response and recovery—of the disaster management cycle (DMC) [4].

Especially the coordination of non-governmental organizations (NGOs) in procuring relief items in the response stage seems to be a critical step in RSCM as the complexity of the situation overstrains the current decentralized coordination approach that non-governmental organizations (NGOs) follow in most disaster relief missions [5,6]. For any way of coordinating NGOs, i.e., organize, align and differentiate their activities in relief

items procurement, we refer to the term “coordination approach” in the rest of the article [7]. Here, effective coordination refers to organizing the right procurement tasks in such a way that beneficiaries’ needs are satisfied. Efficient coordination indicates optimally organizing these tasks to meet the beneficiaries’ needs under consideration of costs (i.e., at lowest possible prices, at highest product quality, shortest lead time, etc.). Decentralized coordination is often characterized by low levels of information sharing and weak cooperation between responding NGOs that often leads to coordination mistakes [8]. This decentralized coordination approach in relief items procurement indicates that decisions regarding relief items types and quantities are taken in relative isolation from one NGO to another, impacting the effectiveness and efficiency of procurement coordination [9]. In this rather fragmented structure, each organization manages its procurement processes decoupled from others that are also involved in the overall demand satisfaction process [10]. The poor communication of procurement decisions between NGOs leads to the effect that uncertainty in demand of independent resources negatively impacts the internal procurement process of the organization [11]. For example, do NGOs procure emergency vehicles in most cases independently from each other and on an ad hoc basis? Communication about vehicle demand is not forwarded in this decentralized system, leading to higher purchasing costs for single NGOs [12]. Aside from increased costs, the lacking inter-organizational coordination and communication extends procurement-to-distribution lead times, resulting in delayed demand satisfaction of beneficiaries [13], such as, for instance, during emergency activities in the 2013 North India floods. Here, coordination inefficiencies led to many NGOs independently working on the ground, leaving vast areas completely untouched by relief supply, caused by massive delays in procurement operations and supply distribution [14]. Coordination problems were also observed in the 2004 Indian Ocean tsunami, hurricane Katrina, the 2010 Haiti earthquake, or the ongoing COVID-19 pandemic, reflected by congestions of relief item deliveries at airports or NGOs’ competition for scarce resources [15]. With the decentralized coordination of procurement activities, it is also often reported that an increasing number of stakeholders adds additional complexity to the situation in the disaster location. For instance, in the Haitian earthquake, more than 300 NGOs of different size and background converged on the ground, leading to massive coordination turbulences in the first weeks [16].

Coordination inefficiencies do not only derive from a plethora of international, national and local stakeholders, but also from other problem areas and challenges that impede the coordination of procurement activities. Cultural conflicts between involved NGOs, a different understanding of mission statements, the unwillingness to cooperate with each other and a lack of skilled workforces are other challenges and problems of decentralized procurement coordination [17]. Other reasons for weak coordination are grounded in different organizational structures of responding NGOs, the absence of mutual trust and respect that NGOs give each other and unfavorable operational conditions [18]. Furthermore, reports reveal that resources within the relief chain are unused or wasted to some extent and relief efforts are initiated slowly [19,20]. These challenges in coordinating procurement activities quite often result in the duplication of efforts and redundant relief items supplies into single disaster regions [21]. Managing this oversupplies and unnecessary aid is often regarded as the disaster after the disaster [22]. Ineffective aid distribution to beneficiaries, increasing numbers of deaths and injured people struggling to receive deliveries and higher financial costs are further consequences of this ineffective and inefficient coordination [23,24].

In recent years, there has been a mounting interest in researching the root causes of the challenges in decentralized procurement coordination in order to give advice on how to jointly confront the most serious of the existing challenges. Current research aims at extending knowledge, as procurement coordination is still a highly problematic topic with little progress towards improvement in recent years. Its complexity might increase in the future with the involvement of monetary values, donor funding, unpredictability, higher uncertainty of disaster occurrence and lacking resources that limit NGOs’ scope

of actions [25]. Moreover, humanitarian organizations find themselves in increasingly dynamic and politically charged disaster settings, which calls for interdisciplinary research, involving academics from other disciplines [26]. Scientific evidence for the failure of recently introduced efforts for solving some of the coordination problems in practice underlines the pressing need to deepen the understanding of core challenges and to explore adequate problem solutions [10]. As our intention is to contribute to this call of enhancing the current coordination practice, this study aims at identifying additional challenges and problems in procurement coordination by case study research [3,5,17]. Therefore, we develop a theoretical framework that consists of the phases of the DMC and dimensions to capture challenges in procurement coordination between (inter-NGO) and within the internal structure of NGOs (intra-NGO). Additionally, we have the objective to elaborate improvement activities and alternative coordination approaches that offer potential to solve certain challenges and problems of present practice. Revealing challenges and understanding their reasons may help to elaborate on improvement strategies that benefit the disaster-affected people in the short term. In doing so, this study complements the existing body of literature and broadens practitioners' horizons by answering the following research questions (RQ):

- RQ 1: What are the challenges in decentralized procurement coordination?
- RQ 2: At which stages of disaster management do challenges reduce the effectiveness and efficiency of procurement coordination most?
- RQ 3: Which activities and alternative coordination approaches offer potential to improve current procurement coordination practice?

This paper is structured as follows: Firstly, we review existing literature on challenges in relief supply chain coordination. Next, we present theoretical foundations with respect to procurement coordination in relief supply chains and introduce the applied methodology. Finally, the results of the case study research are illustrated, followed by a discussion and an outlook to future research.

## 2. Related Literature

This section reviews current literature on humanitarian logistics procurement and dedicates special attention to existing work on challenges and problems in procurement coordination practice. Papers dealing with emergency items procurement quantitatively analyze the current situation, propose process innovation and introduce new mechanisms and policies for more accurate resource acquisition. For instance, Falasca and Zobel [27] present a two-stage stochastic decision-making model for procurement in humanitarian logistics. The model's aim is to illustrate the procurement process and uncertainty inherent in disaster situations for more effective and efficient procurement processes. Pontré et al. [28] develop a risk assessment and management tool for providing objectivity for country procurement risk monitoring and review in high-risk situations. This tool supports decision-makers in relief items procurement, through procurement risk rating within high-risk country offices. Special research focus is also placed on procurement auctions and bid construction in the humanitarian context. Here, optimal auction mechanisms including substitution and partial fulfillment are presented in order to increase the efficiency of the procurement process, i.e., improved resource allocation and increased aid volumes [29–31]. Eftekhari et al. [32] develop optimal vehicle procurement policies to strengthen strategic asset planning. By using a linear programming model and a stylized quadratic control model, they propose optimal policies that enable to determine the optimal fleet size under a given emergency demand. Options of advance purchasing and pre-positioning of inventories are also investigated, as these strategies offer the potential to relax the situation of urgent relief items procurement in the immediate response to disasters [33,34]. Process innovation is proposed by Pazirandeh and Herlin [35], who investigate the impact of cooperative purchasing on buyers' purchasing power in the humanitarian setting. In their view, the efficiency and effectiveness of humanitarian procurement can be increased by forming

purchasing consortiums, including numerous humanitarian organizations that are willing to buy relief items within group structures.

Aside from reviewing general work on effectiveness and efficiency enhancement in humanitarian logistics, we now delve into existing literature on challenges that are characteristic in disaster relief operations. The identification of challenges and impediments in coordinating humanitarian stakeholders in various relief supply chain activities—with special focus on procurement—has recently moved into the focus of academic research. Events such as the tsunami in the Indian Ocean in 2004, hurricane Katrina in 2005 or the Nepal earthquake in 2011 demonstrated that humanitarian organizations face massive impediments and challenges that negatively impact the effectiveness and efficiency of aid coordination [16,23]. Once a disaster strikes, different international, national and local relief organizations converge in the disaster region, leading to a heterogeneous pool of aid agencies to be coordinated in various activities. The high number of stakeholders and their diversity with regard to organization culture, language and internal structures cause massive turbulence in managing relief tasks [36,37]. The little knowledge that NGOs have of each other, which often results from poor communication, brings additional complexity in the first hours after a disaster [3]. Cultural conflicts deriving from different NGO backgrounds, mission statements and visions, entail the risk of disrupting the whole relief supply chain due to the partial unwillingness to cooperate and coordinate emergency activities between organizations. High coordination costs, time-consuming coordination meetings and insufficient cooperation by government officials with NGO representatives are other potential sources for challenges and impediments in relief supply chain coordination. Especially the missing governmental involvement in distributing valuable information to aid contributors hinders the installation of high-performance coordination, as it was observed in the response missions to the Indian Ocean tsunami in 2004 [19,38]. Also, there is a general lack of skilled workers that have the competences and knowledge to coordinate several time-consuming processes, such as competitive bidding and customs clearance, in a highly efficient way [3,17].

The dynamic, unregulated and unpredictable coordination environment, where usually no single organization has the authority to engage others in coordinating activities, further hampers the situation [39]. Governments of disaster-affected countries often do not have the necessary experience and know-how to manage and organize humanitarian stakeholders in their tasks. Differences in experience and knowledge levels are also observable among NGOs due to some organizations having zero experience and some which are highly experienced in relief chain coordination [40]. Aside from this, the level and quality of coordination on the ground is affected by the present funding structure. Within the current funding system, NGOs' capabilities to act are mostly dependent on donors that are willing to support organizations by financial means if NGOs fulfill their expectations in providing humanitarian assistance. When NGOs fail at meeting donor expectations, they eventually run out of funding, which restricts them in continuing disaster relief. If the media then reports fake news about NGOs, donors become even more reluctant to donate [18]. This financial dependency of NGOs on donors forces them to compete for them, which triggers additional chaos in coordination efforts [20]. In these situations, NGOs are only partly willing to share crucial information, thus leading to severe information management barriers [41,42]. However, high levels of communication and information exchange could avoid the aforementioned challenges that reduce the effectiveness and efficiency of coordination performance [43]. Consequently, organizing such volatile financial flows among all contributing parties is not conducive to efficient coordination. After all, externalities, such as demand/supply uncertainties and disaster unpredictability, i.e., having no knowledge about sudden onset disaster occurrence (location, timing, intensity) a priori, also make it extremely challenging to implement coordination mechanisms and to forecast resource requirements. Finally, insufficient resources (human, financial, technological, etc.) within NGOs add complexity to the situation, as coordination tasks have to take resource sharing into consideration [5].

### 3. Procurement Coordination in RSCM

Successfully overcoming disasters often requires the involvement of multiple players that contribute their expertise, manpower and resources to the goal of alleviating the suffering of disaster-affected populations. Papers dealing with stakeholder coordination in RSCM point to many different actors in disaster aid provision [3–5,44–46]. Accordingly, the main stakeholders are large governments and their donor agencies, delivery partners such as international NGOs, multilateral/international organizations and their specialized agencies. Moreover, private sector parties including vendors or suppliers of food and non-food items and transportation, shipping and freight forwarding companies are included in procurement coordination. Other stakeholders, such as governmental agencies of the aid-receiving country, community-based organizations, corporate donors, international media and military are also involved in the coordination of procurement activities. Dependent on the magnitude and severity of disasters, the set of aid providers can vary from only community-based organizations and local relief teams operating in disaster management, to the activation of all available resources from international, national, multilateral and private stakeholders.

In disaster situations, the procurement of relief goods in the right quantity, at the right quality and at the right price is of utmost importance for the above-mentioned players, aside from other activities in the immediate response phase. Operations performed during this phase aim to respond flexibly and quickly to upcoming needs and to cover demand patterns of crisis-hit populations under cost-efficiency [47]. When disasters devastate regions, procurement processes are mostly initiated on an ad-hoc basis. Chaotic post-disaster environments, the absence of efficient resource allocation and the high number of different stakeholders are characteristic for procurement coordination in disaster settings. For example, over 40 countries and more than 300 different NGOs contributed to disaster aid in the wake of the 2004 Asian tsunami [5]. In order to handle the altered situations of coordinating humanitarian procurement, it became increasingly important to implement preparedness strategies, which speed up the supply process in the case of an emergency [48]. Procurement in advance leads to pre-positioning of inventories at critical locations, where the threat of disasters is considerably high. This approach relaxes the demand satisfaction process in the first hours after the disaster considerably, as initial demand can be quickly covered by pre-positioned relief items [33].

Procurement coordination in the context of RSCM differs to commercial supply chain management (SCM) in various dimensions. Demand patterns in SCM are more stable and easier to predict by using forecasting techniques, whereas in RSCM, the level of uncertainty with respect to quantity, time and place is significantly higher, as future disasters are difficult to predict. SCM handles mostly predictable supply patterns, which is not the case for RSCM, where demand is rather uncertain and caused by disruptive incidents [29,43]. Flow types in SCM primarily include commercial items which create a benefit for customers that are willing to buy the products (pull strategy). By contrast, RSCM handles resources and products, such as evacuation vehicles, shelter, food, sanitation equipment, power or drinking water, which serve to cover basic humanitarian needs (push strategy) [49]. The stakeholders in commercial procurement are generally represented by factories, freight forwarders, distributors, retail stores and customers. In contrast to this, the main stakeholders in humanitarian procurement are international and local NGOs, governments, aid agencies, private sector companies and beneficiaries. As the stakeholder portfolio is highly diverse, attention should be given to the characteristics of the individual stakeholders in order to better understand the specialties of procurement coordination in RSCM.

Due to the above-described differences between procurement coordination in commercial SCM and RSCM, theoretical approaches to describe the key elements that drive performance are assumed to be not completely identical and applicable to the same extent in both settings. Therefore, analyzing challenges in humanitarian procurement coordination requires the adaption of existing theoretical perspectives and consideration of the unique

characteristics when developing the theoretical framework of this study. In the very specific field of RSCM coordination, elements of two specific theories, namely resource-based view and relationship theory, are deemed relevant to explain coordination efforts [50]. General supply chain coordination theory in commercial SCM assumes that inter-organizational aspects (such as responsibility interdependence, inter-functional conflicts, etc.) mainly determine coordination performance between stakeholders [51]. However, in the criticality of humanitarian procurement coordination, other aspects such as resource sharing, inter-organizational dependencies and information sharing determine the success or failure of coordination processes. Previous studies have already highlighted the relevance and challenges of establishing inter-organizational interdependencies between NGOs, specifically highlighting trust as a critical component to realize successful coordination on a generic level [52,53]. This underlines the importance of concentrating on inter-organizational aspects when investigating challenges in procurement coordination. Hence, we include this dimension in the theoretical framework of the study. Aside from inter-organizational sources of inefficiencies, internal processes within NGOs might constitute further challenges in procurement coordination. The consideration of intra-organizational challenges is reasoned in the personnel structure including volunteers and paid workers in most NGOs. Different levels of expertise and motivation among the two sets of personnel might cause various troubles in the procurement coordination process. Also, missing control mechanisms for funding and procurement financing justify a deeper analysis into the intra-organizational procurement coordination [54]. To capture new insights on this intra-organizational perspective, we consider this dimension in our study and integrate it in the theoretical framework. What's more, no other study is available that considers the phases—mitigation, preparedness, response and recovery—of the disaster management cycle when analyzing challenges in procurement coordination [4]. We argue that those phases are highly important to gain structured and granulated knowledge of challenges at the most detailed level. Therefore, the theoretical framework is complemented by those four phases. By taking the phases into consideration, this study closes an important knowledge gap and contributes to theory development in this domain. This also serves for identifying phases that are in urgent need of introducing improvement strategies due to multiple challenges affecting the performance of RSCM in these specific stages of the DMC. As the possibility is given that certain challenges are not clearly assignable to one of the predefined framework dimensions, we collect any relevant information in the dimension “Overall problems/challenges”. Filtering additional information supports revealing yet unknown challenges and facilitates the theory building of the study at hand. Table 1 illustrates the theoretical framework including dimensions and corresponding explanations.

**Table 1.** Theoretical framework for analyzing challenges in procurement coordination.

Disaster Management Cycle (DMC)							
	Mitigation	Preparedness	Response	Recovery	Inter-NGO	Intra-NGO	Overall Problems/Challenges
Explanation	Challenges that occur in the mitigation phase independent from a specific disaster	Challenges that occur in the preparedness phase in advance to disasters	Challenges that occur in the immediate response phase to disasters	Challenges that occur in the recovery phase after disasters	Challenges that occur between two or more NGOs	Challenges that occur in the internal structure of the NGO	Overall problems and challenges in procurement coordination

#### 4. Methodology

Due to our intention of identifying and understanding the challenges of today's procurement coordination, we turned to practitioners in order to grasp their point of view and to collect findings along the dimensions of the theoretical framework. Among the variety

of scientific instruments available, case study research seems to be a reasonable method for answering the research questions of this paper. Aside from quantitative methods which are limited in terms of offering holistic and in-depth explanations of a real-world phenomenon, case study research enables us to better understand the behavioral conditions of the investigated subject. It further supports to illustrate the complexities of real-life situations—challenges of procurement coordination in this study—which is quite difficult to capture by using surveys or secondary data from existing reports. Especially for new research streams, case study research is a promising methodology for defining hypotheses, describing a phenomenon within its context and developing theories [55]. Yin [56] distinguishes three different types of case study research, i.e., exploratory, descriptive and explanatory case study research. According to the author, exploratory case study research aims at defining the questions and hypothesis of a subsequent study. Descriptive case study research describes a phenomenon within its real-world context and explanatory case study research tries to explain how events happen (cause-effect relations). In our study, we follow descriptive case study research, because our intention was to describe challenges and problems in current procurement coordination practice. Expert interviews therefore constitute the source of information for revealing challenges related to decentralized coordination of humanitarian procurement actors. Furthermore, we aim to identify improvement activities and alternative approaches to coordinate procurement activities driven by the increased call for revising traditional coordination strategies in relief supply chain procurement [57]. In structuring the case study research, we follow the research process model by Stuart et al. [58], who classify case study research into several phases, i.e., developing research questions and documentation instrument, data gathering, data analysis and dissemination of findings.

#### *4.1. Stages 1 and 2: Research Questions and Instrument Development*

The developed research questions reflect the descriptive character of this paper with the objective to describe concepts in the real-world, looking for challenges in the current procurement coordination process. The complexity of procurement coordination and the heterogeneity of involved stakeholders led us to follow multiple case study research. In our sampling, we followed the approach by Flick [59], who suggests to select cases in qualitative research not because they represent the entire population but owing to their relevance to the research subject. This led to a very precise understanding of requirements that have to be fulfilled in order to include the organization into the case study sample. Here, we placed special focus on cases from the international relief actor context due to their high relevance in supporting response missions to large-scale disasters worldwide. Consequently, the first requirement for cases to be included in our study states that the case organization operates internationally in disaster relief. Secondly, we claim that the case organization has its own in-house procurement units and is actively involved in coordinating procurement activities in large-scale disasters. As another intention in this study is to identify improvement strategies and alternative coordination approaches, we also sought for start-ups in the field of procurement coordination. Due to the evolution of structured logistics processes in military history, we are of the opinion that military forces' knowledge on logistics and expertise in procurement coordination is highly valuable and should also be integrated in this study. According to these requirements, we selected seven representative cases and conducted interviews with experts of each organization. The selection of interview partners followed a standardized procedure within every single organization. Firstly, an official/representative was contacted by email and telephone to express our interest in including the organization in the case study analysis. Afterwards, the study objectives were presented and discussed in detail to support the official in the selection of the most appropriate candidate for the expert interview. Specifically, we were looking for informants with humanitarian logistics background, long-term experience in the field of emergency items procurement and knowledge about current procurement practice. Under consideration of these requirements, further communication was established with the responsible/most

knowledgeable person of each organizations' procurement unit, who finally represented the informant in the expert interviews. Table 2 gives an aggregated overview about the main characteristics of each case. Here, we name the type of organization (start-up, NGO, military), type of relief chain function (buyer, supplier, platform), founding year, number of employees (volunteers and full-time workers), scope of activity, disaster experience, position and location of the informant and annual procurement expenditures.

#### 4.2. Stage 3: Data Gathering

Prior to the actual data gathering, a semi-structured interview protocol was developed. Semi-structured interviews offer the opportunity to guide the expert through the interview by asking specific questions and eliciting valuable information from open comments made by the interview partner. Consequently, the interviews followed a standard form (within a duration range of approximately 45 to 71 min), including 20 open questions derived from the underlying research questions of the study (the interview guide is included in Appendix A). The questions focused on the general procurement process within relief chains, on the current coordination practice in relief items procurement and on the experts' opinions on how to improve coordination performance. Aside from this, we intended to identify improvement activities and alternative coordination strategies that, according to the experts, offer the potential to solve problems and challenges experienced in the current coordination system. For our case study research, we organized five face-to-face meetings in Klagenfurt and Vienna, Austria, and held two telephone conferences with experts located in Amsterdam, Netherlands, and Innsbruck, Austria, between January and April 2020.

#### 4.3. Stages 4 and 5: Data Analysis and Dissemination

Stage 4 "Data analysis" started with the transcription of audio records of the interviews as preparation for the qualitative content analysis [60]. A word processing software was used to transcribe the audio-recorded interviews. To increase the rigor of the transcription process, we asked the expert partners to check the interview protocols for misspellings and incorrect formulations within their own statements. Unfortunately, not all of them followed our request, leading to some transcriptions without crosschecking. The returned documents were then subjected to a process of coding using a coding software (NVivo 11). Coding of transcribed interview protocols is used for a systematic and consistent investigation of qualitative data using a previously defined set of dimensions [61]. Coding an interview protocol according to the dimensions of the theoretical framework (Table 1) in NVivo means that qualitative information from the interview protocols is assigned to the dimensions of Table 1. In NVivo terminology, the dimensions of Table 1 are represented by nodes which are combined in a coding sheet (collection of all nodes). Technically speaking, a term which is relevant to one or more dimensions of Table 1, i.e., coding sheet, is marked by mouse action and assigned to a designated dimension (node in NVivo). Afterwards, the coding software assigns a code to this word. We coded the transcribed interview protocols according to the dimensions of Table 1, i.e., the stages of the DMC, inter- and intra-NGO perspectives and a collection of challenges that are global in the context of procurement coordination. Table A1 provides examples of coded information for the dimensions of Table 1 in order to further illustrate the data analysis.



Table 2. Case characteristics.

Case	Type of Organization	Type of Relief Chain Function	Founding Year	No. of Employees (at National Level in 2016)	Scope of Activity	Disaster Experience	Position of Informant	Location of Informant	Annual Procurement Expenditures *
C1	Start-up	Platform	2015	10	Independent platform for suppliers and NGOs to enable joint procurement of all kinds of relief items.	Refugee crisis in Austria (2015); COVID-19 pandemic (2020)	Procurement agent	Austria	-
C2	NGO	Buyer	1949	1467	Works to meet children's needs and protect their rights. Main focus is put on children in need of family-based child care.	Indian Ocean tsunami (2004); Nepal earthquake (2015); Refugee crisis in Austria (2015)	Procurement agent	Austria	89.8 mil. €
C3	NGO	Buyer	1880	81,834	Operates in national and international emergency response and provides emergency medical services, blood-donation-services and social-, development- and healthcare programs.	Haiti earthquake (2010); Amatrice (Italy) earthquake (2016); Bosnia and Herzegovina floods (2014); Refugee crisis in Austria (2015); COVID-19 pandemic (2020)	Head of procurement and logistics	Austria	48.6 mil. €
C4	NGO	Buyer	1903	53,882	Federation of 165 relief, development and social organizations operating in more than 200 different countries worldwide. Provides support and assistance in crisis, disaster scenarios and other catastrophes.	Indian Ocean tsunami (2004); Refugee crisis in Austria (2015); Nepal earthquake (2015)	Procurement agent	Austria	45.7 mil. €
C5	Military	Buyer/Supplier	2005	55,000	Aside from military interventions the case organization assists in disaster response and is specialized in water treatment systems and debris removal.	Indian Ocean tsunami (2004); Bosnia and Herzegovina floods (2014); Refugee crisis in Austria (2015); COVID-19 pandemic (2020)	Procurement officer/Lieutenant-colonel	Austria	-
C6	NGO/Start-up	Platform	2016	700	Platform for suppliers and NGOs to procure low cost, quality-assured lifesaving medicines and health related commodities to fight HIV, TB and malaria.	Malaria case management in sub-Saharan countries (since 2017); COVID-19 pandemic (2020)	Senior manager of procurement	Nether-lands	310 mil. € (Transaction volume at platform)
C7	Start-up	Platform	2016	20	Platform for suppliers and NGOs to identify resources globally and match them with the needs of disadvantaged regions.	Refugee crisis in Jordan (2011–2017); Mobile and rapid medical diagnosis provision for detecting diseases (since 2018)	Senior expert in humanitarian logistics	Austria	-

\* Related to national and international emergency response.

Once the extraction of qualitative information from the interview protocols was done, we performed a cross-case analysis in order to identify potential patterns in our findings. In doing so, we observed some patterns in the dimensions “Inter-NGO” and “Intra-NGO” of Table 1, such as, for instance, the human component was identified in almost all cases as one major source of problems and challenges in procurement coordination. Here, the resistance to change and the unwillingness to share information was denoted by four of our interview partners. Finally, in the last step of the case study process (dissemination), we documented our findings by developing Table 3 and describing the results in the next section of the paper. The validity of our findings is supported by the fact that some results are congruent with results of existing scientific literature. Additionally, the assessment and coding of the papers was carried out independently by two researchers in order to avoid any potential bias and to increase the reliability of our findings. Cohen’s Kappa was calculated with 0.89, which indicates the high quality of the coding procedure. It should be added that our aim is to generalize to theoretical concepts and not to populations, thus emphasis is put on analytical and not on statistical generalization [62].

**Table 3.** Results of the qualitative content analysis.

Challenge Description	Disaster Management Cycle (DMC)					Inter-NGO	Intra-NGO	Overall Problems/Challenges
	Mitigation	Preparedness	Response	Recovery				
Redundant Resource Acquisition		C1	C1, C2, C7					
Resistance to Change							C2	C3, C5
Unwillingness to Share Information						C1, C4, C5	C3, C5	C2
Different Thinking in Preparedness Activities		C2						
Needs Assessment		C6	C4					
Competition			C4, C7			C1		
Division of Competences			C4					
Inefficient Resource Management			C3					
Inexperience in Procurement			C2					
Artificial Price Inflation			C2					
Media Attention			C2					
Complex Bureaucratic Hurdles			C6			C6		
Individualism in Supplier Selection		C1	C1					

## 5. Findings and Discussion

### 5.1. Challenges in Procurement Coordination

The qualitative content analysis of collected data resulted in the identification of different challenges mentioned by the expert interview partners, see Table 3 “Challenge description” (RQ1). In accordance with the results presented in Table 3, most challenges of procurement coordination occur in the immediate response to disasters. The disaster preparedness phase is also characterized by several challenges; however, the extent is not that critical compared to the response stage. None of the expert interview partners mentioned any challenges in the mitigation and recovery phases. A possible explanation for this is that procurement activities are in general conducted as part of the preparedness and response to disasters and are not directly linked to the other two dimensions. Challenges of coordinating procurement activities were also identified within and between NGOs. Here, the misbehavior of relief workers was mentioned as the main source of inefficiency that negatively impacts coordination activities (NGO-related dimensions) (RQ2).

In the following, we discuss the challenges that hinder the process of common procurement coordination in more detail.

- Redundant resource acquisition: Parallel acquisition of emergency items, such as trucks, generators and tents, is quite often the result of weak cooperation and poor communication between aid organizations. A general lack of information transparency is denoted as the major driver for redundant resource acquisition. Experts stated that procurement operations even within multilateral organizations, such as the United Nations (UN), were conducted simultaneously, thus resulting in unused resources in the military and civil UN system. This was underlined by the statement of the case 7 expert who reported from one response mission where “ . . . NGOs procured staff in parallel. Every NGO bought their own land cruisers, generators and other material. Suddenly, there was a vast amount of the same things in the region and nobody knew how to handle it.” Redundancy in the immediate response to disasters is even greater, resulting from multiple NGO assessment teams on the ground, reporting duplications of demand quantities to their headquarters.
- Resistance to change: People in charge of coordinating procurement activities are partly resistant to improvement strategies and quite often unwilling to change certain patterns of their own behavior. Experts mentioned that people in power do not often think outside the box, albeit they could make use of innovative ways of coordination and cooperation. They stick to longstanding strategies that are not up-to-date and adjusted to the more complex requirements of today’s disaster management. Especially in military operations, where structures and processes are extremely well-defined and mandatory, peoples’ narrow-mindedness leads to inefficient coordination of internal procedures. The resistance of people in power to change their behavior towards improvement hampers initiatives for better cooperation and communication between NGOs, which is not clear to everybody, in accordance with the statements of the experts.
- Information sharing: Wrong, insufficient and delayed information is fairly present within and between NGOs, as it was reported by the interview partners. One NGO representative said that voluntarily managed NGOs in particular often face unoccupied positions, causing internal information flow disruptions. For such NGOs, it is challenging to replace missing positions due to a limited number of non-paid experts within this voluntary organization structure. Especially for smaller NGOs, it is often hard to filter relevant information transferred between big players on the ground. Vice versa, main aid contributors are often not able to receive important information from smaller NGOs due to non-standardized communication channels within the relief chain. Information asymmetries do not only derive from non-regulated channels but also from personal feelings, i.e., the unwillingness of people in charge to pass on information. Non-communication of information is executed on purpose with the intention of keeping up their competitive advantages over others.
- Different thinking in preparedness activities: Disaster procurement in advance, i.e., in the preparedness stage, is handled differently from one NGO to another. Some organizations have pre-negotiated agreements with suppliers at their disposal, in order to speed up procurement when the need arises. Others enter relief items procurement completely unprepared, bringing massive turbulence to coordination efforts. The use of pre-positioning as a preparedness activity is dependent up to a certain point on the availability of financial means of NGOs. Pre-positioning items in warehouses ties up capital, which lowers NGOs’ financial liquidity. Other forms of preparedness, e.g., pre-negotiating contracts with suppliers [63,64], do not require high investments and therefore are also attractive for smaller NGOs. This different prioritization of preparedness activities of NGOs leads to inconsistencies and unsynchronized processes in the overall procurement coordination.
- Needs assessment: Coordinating the different NGOs in needs assessment has the identical relevance as in the procurement of relief items. Efficient needs assessment, i.e., evaluating the victims’ needs in terms of product type, quantity and quality, provides the basis for coordinated procurement processes. It was reported that on-site

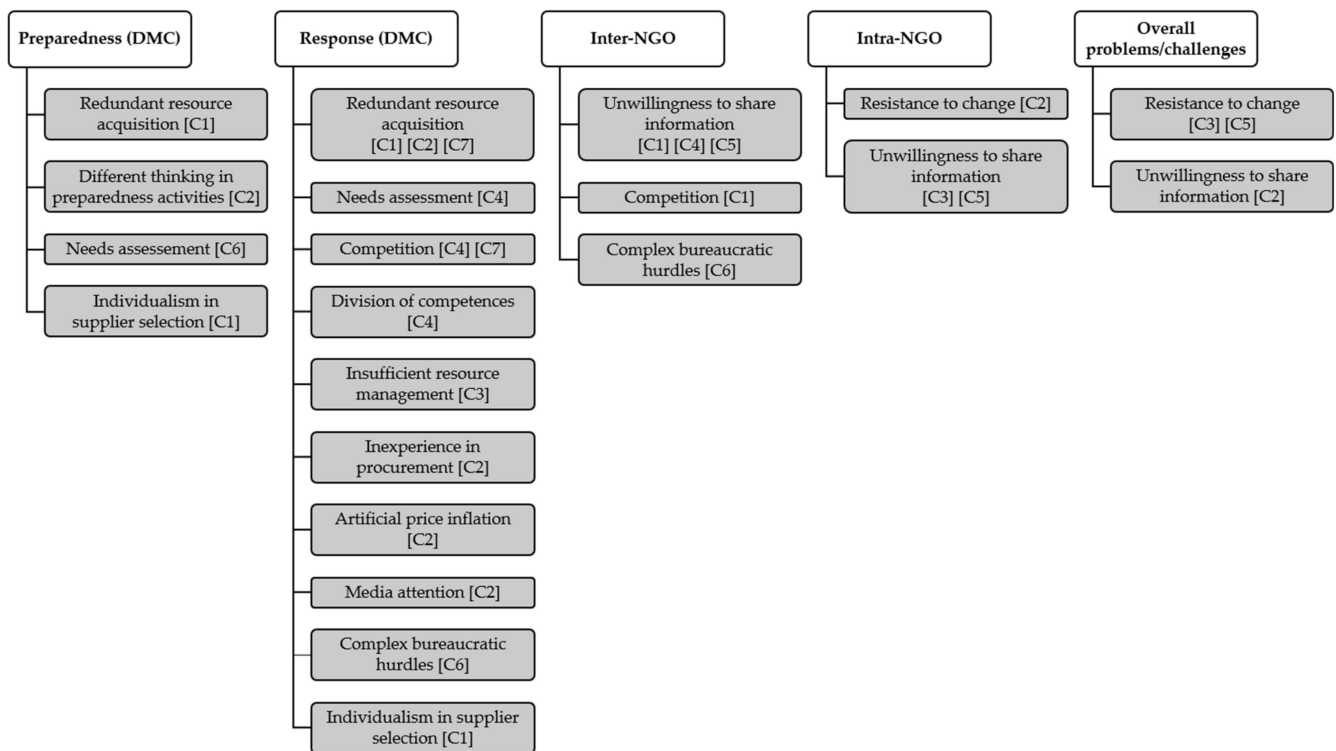
assessment meetings for information sharing and updating are not always attended by all aid organizations. Albeit it is mandatory for NGOs to participate in these meetings, some of them consider this step in disaster relief as irrelevant and skip these important meetings and conduct demand assessment detached from others. The higher number of diverse NGOs in large-scale disasters amplifies this effect, leading to an uncontrolled multiplication of reported demand quantities. If information regarding demand types and quantities is not disseminated throughout the whole relief chain, the risk of incorrect, redundant or insufficient procurement exists.

- Competition: Some interview partners described RSCM as a highly competitive environment, where the fight for scarce financial resources, in particular from private donors, is always present. Competition in the field is due to the fact that NGOs are financially dependent on public and private sources [65]. This competition aspect is an inevitable result of the present funding structure, where private donors are the main source of financial support [52]. Consequently, NGOs that attract a lot of media attention are more likely to receive financial support compared to others enjoying lower levels of popularity. NGOs therefore compete for financial resources by maximizing their media appearances. Another source of competition between NGOs is missing incentive systems that should motivate organizations to work in tandem instead of fighting against each other.
- Division of competences: Some parts of the relief community struggle to distribute tasks, competences and responsibilities across all stakeholders in such a way that NGOs meet the requirements made of them. It is often a time-consuming process to assign duties and responsibilities, i.e., needs assessment, items procurement and distribution, logistics support, medical treatment, psycho-social care, etc., to trusted organizations. In such scenarios, a leading role has to be taken by experienced NGOs, e.g., UNOCHA—United Nations Office for the Coordination of Humanitarian Affairs, due to their long-term experience in conducting competence distribution. In accordance with some experts, this leading position is not occupied in every single disaster response, resulting in reported difficulties in competence division. It was observed that NGOs expressed their willingness to procure certain products, although they lacked significant experience and the capabilities to do so.
- Inefficient resource management: Having sufficient resources on hand requires a real-time inventory management and early-warning systems implemented in NGOs in order to avoid stock-out situations or supply failure in the relief items delivery to disaster locations. Within some NGOs, the ingress and withdrawal of staff, supplies and resources remain completely uncontrolled until sudden stock-out situations are reached. Enterprise resource planning systems (ERP systems), as they are used in the commercial sector, are not widespread in humanitarian organizations. The expert of case 3 stated that “ . . . some NGOs try to work with their own in-house resources as long as possible and then suddenly they recognize that they have already reached stock-out situations, which then is definitely too late to react appropriately.” What is really needed according to the experts is the provision of health management systems and the implementation of inventory information systems. Acquisition and maintenance costs are far too high to make sophisticated ERP systems affordable to NGOs. To compensate expected resource bottlenecks, NGOs procure relief goods at high prices from unreliable supply sources in the disaster area, which try to exploit the disaster situation.
- Artificial price inflation: High-intensity disasters activate numerous organizations of different size to contribute to relief operations. If smaller NGOs are not able to procure from global suppliers or do not have knowledge about their internal resources, as already mentioned, they rely on local manufacturers. Aside from the objective of rehabilitating the regional economy, such NGOs try to procure on site, becoming trapped in artificially inflated prices. The obscure procurement phase, which is basically unregulated within disaster regions, offers the perfect environment

for suppliers from outside to pollute the market with overpriced relief items of low quality. It was reported by the interviewee of case 2 that “... some local suppliers on the ground exploit the situation and then the price for a small box of food increases up to 20€, because the situation is like this”. Filtering “bad” from “good” suppliers is almost impossible due to the large number of different actors and time constraints in the disaster region.

- Media attention: The media plays a key role in the funding performance of humanitarian organizations. During humanitarian responses of recent years, it turned out to be a blessing and a curse at the same time. On the one hand, the media serves as a communication channel and advertisement instrument to public and private donors, i.e., media is used to acquire financial means of donors. Especially smaller NGOs that do not have their own in-house procurement agents can benefit from media attention, as this is the only way for them to procure items, because they do not have people in charge of procurement in their own organization. On the other hand, if media highlights the need of already covered demand for certain relief products, the risk of redundant supplies exists. Misleading media attention combined with low information exchange between NGOs intensifies this effect. Experts reported that some NGOs try to avoid letting too much information disperse to the public in order to maintain better control of the situation and to avoid unsolicited donations.
- Complex bureaucratic hurdles: The criticality of relief items procurement in emergency missions calls for efficient decision-making to best serve the beneficiaries in the disaster region. Humanitarian experts complained about facing too much bureaucratic and administrative paperwork in critical procurement activities, tying up manpower which could be used elsewhere in the procurement process. The major sources of criticism from the experts’ perspectives were non-standardized procurement processes that need to be regulated by the humanitarian community and an increasing number of governmental regulations, which—they believe—leads to an undesirably heavy workload. People in charge are more involved in document processing than in coordinating the actual procurement and delivery of relief items. The expert of case 6 stated that “... we face so many humanitarian emergencies and large epidemics and you find at the front line severe human resource constraints because you have too many people in the central ministry following so much paperwork and you cannot pay the nurse on the ground anymore”, which underlines the inefficient allocation of human resources in the total procurement coordination. According to the interviewee, there are too many people working in governmental institutions and not enough properly operating on the ground. This negatively impacts the relations between NGOs and governmental institutions, because overruling or disregarding these regulations is often the only option for NGOs to speed up the procurement procedure.
- Individualism in supplier selection: The decentralized character of procurement coordination with procurement agents taking partly isolated decisions tempts some of them to select suppliers based on their individual feelings and perceptions. Especially in pharmaceutical supply chains, it is often observed that suppliers are selected based on their length of relationship or informal agreements with the buyer and not on product quality or price. This lack of transparency in supplier selection potentially harms the customers and beneficiaries in disaster regions as the delivered product quality may not meet the required standards for proper medical treatment. Insufficient governmental regulations and the generics market support this individualism of procurement agents in selecting suppliers. These insights were reported by the expert of case 1 who has long-term experience in pharmaceutical supply chain management.

None of the interview partners complained about difficulties and obstacles in regard to the mitigation and recovery phases of the DMC. Less time pressure and lower urgency to coordinate activities in the recovery phase may represent reasons for this. In Figure 1, we graphically depict the main results related to the challenges identified along the dimensions of the theoretical framework.



**Figure 1.** Condensed results of the qualitative content analysis.

The above list should not only be a reflection on sources of inefficiency in procurement coordination but should also motivate the development of testable propositions. These propositions should stimulate future research activities and pave the way towards improved coordination in humanitarian procurement. As an example, we were told that procurement agents' narrow-mindedness when it comes to adopting improvement strategies prevents efficiency increase, thus we suggest the proposition that waiving the resistance to change their behavior brings immense efficiency gains to procurement coordination. Other propositions were derived from the expert statements in the same fashion. The following list presents a snapshot of propositions concerning actions for enhancing the performance of procurement coordination. Procurement coordination is more effective and efficient when:

- P1. Procurement agents and other NGO representatives waive their resistance to change certain patterns of behavior.
- P2. NGOs and other stakeholders (e.g., media) share more information and data.
- P3. NGOs do not compete with each other.
- P4. NGOs align their preparedness activities.
- P5. NGOs jointly assess demand.
- P6. Competences among NGOs are divided in such a way that NGOs meet the requirements made of them.
- P7. Procurement agents abandon their individualism in supplier selection.

## 5.2. Improvement Activities and Alternative Coordination Approaches

Aside from the identification of challenges in current procurement coordination practice, we aimed to uncover improvement strategies and alternative coordination approaches that, according to the experts, might offer potential for positively changing the current situation (RQ3). These findings also result from the qualitative content analysis of the transcribed interview protocols. In doing so, social media integration and procurement flexibility were identified as improvement activities and cluster and collaborative coordination in the form of coordination platforms seem to be promising alternative coordination

approaches (Figure 2). In the following, we shed more light on each improvement strategy and alternative coordination approach mentioned by the experts. Finally, we derive propositions that are based on a combination of existing literature and the findings of our study.

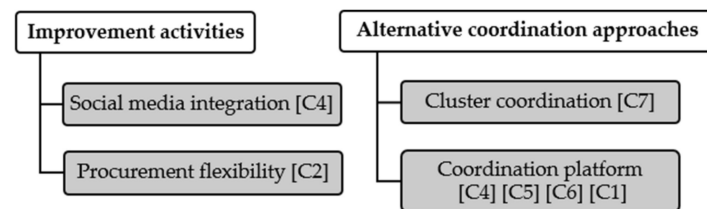


Figure 2. Improvement activities and alternative coordination approaches.

- Social media integration: With the international response activities to the Haiti earthquake in 2010, the role of social media as a crowdsourcing tool in disaster management has become important. Reports state that only 48 h after the devastating earthquake, the Red Cross had received more than US\$8 million in donations via social media platforms including Twitter, Flickr, Facebook and blogs. Since that event, crowdsourcing via social media has become a crucial part of disaster management due to its flexibility, adaptability and boundary spanning functionality demanded by humanitarian organizations for their information systems [66]. Social media enables NGOs to distribute public safety and crisis information, and to send notifications, emergency warnings, requests for assistance and alerts to a broad audience [67]. Another advantage of social media integration is the mapping of demand locations, demand characteristics (quantities and types) and distribution points by processing data of end-users in the disaster-affected areas [68]. Aside from this, the use of social media as a procurement channel has become more and more attractive for NGOs without their own in-house procurement units. Especially for local NGOs, the procurement and distribution of relief items to local beneficiaries has become more efficient with social media. Coordination via social media offers the opportunity to reach a broader audience and to activate resources from volunteers. In particular, smaller NGOs that cannot compete with big players in the field can profit from social media procurement. As illustrated by the expert of case 4, the general process of “online” procurement includes the collection of demand information during the first stage. Afterwards, a responsible person posts aggregated information about required materials and designated points of collection in a social media forum. Then, the members of the social media community respond to this announcement and bring required material to the designated collection points. Communication between users and forum operators tends to be unidirectional, i.e., users do not respond virtually to announcements but with item deliveries to physical collection points. The use of social media supports smaller NGOs in reaching a critical mass of donors, thus empowering them in their resource acquisition at relatively low costs. Another advantage mentioned by one expert was that the procurement process is outsourced up to a certain level due to a self-organizing social media community. A possible limitation of this approach is that the collected relief items could be non-standardized products of low quality, which in the end could cause additional work for the NGO required to filter these unsolicited donations. Overall, the integration of social media into relief items procurement potentially leverages NGOs to save some human resources which could be put into action elsewhere. Based on the above, we offer the following proposition:
  - P1. Crowdsourcing by social media offers NGOs the opportunity to outsource procurement activities and to generate more accurate information about demand characteristics.
- Procurement flexibility: Procurement flexibility in commercial supply chain management has been defined as the ability of a supply chain (including all partners) to

adapt to differing market requirements [69]. Extensively discussed by several authors, procurement flexibility equips supply chains with a certain level of resilience to market volatility and disruptions [70–72]. As humanitarian logistics always operates in markets that are highly volatile with respect to demand patterns and supplier landscapes, the criticality of procurement flexibility of NGOs is even higher. Here, the adequate response to new situations requires flexible structures and processes within and between NGOs. For example, following the Nepal earthquake in 2011, the need for heating equipment in remote areas was urgently given. The longer people would have had to wait for life-saving heating material, the more would have died. For all contributing NGOs, the need was completely clear, and consequently, the procurement process was initialized quite fast. Nevertheless, the situation was complicated by the inflexibility of certain organizations to act faster, ignoring some administrative regulations. Some NGOs transported the required material to these locations but none of them organized kerosene to run the heaters. Internal processes for the procurement of kerosene within some NGOs would have taken two weeks, but the criticality of the situation demanded high flexibility and fast actions. A French NGO jumped into the process and organized kerosene within 72 h by disregarding certain regulations, thus providing high levels of flexibility. This example from practice illustrates an extreme case of internal process flexibility but highlights the importance in relief items procurement. Therefore, our findings indicate that:

P2. NGOs using crowdsourcing by social media for relief items procurement are more flexible in procurement activities and adopt more rapidly to varying demand patterns.

- Cluster coordination: Pooling specific know-how and competences from NGOs and working together on specific tasks increases the efficiency of humanitarian aid provision and brings coordination structure into RSCM. The formation of clusters within the relief chain is a promising method for evaluating and scanning who, when and with which expertise can support relief chain activities. Initially introduced by the UN Emergency Relief Coordinator, this coordination approach is becoming increasingly important in the humanitarian sector, as reported by the interview partner of case 7 with long-term experience within the World Food Programme (WFP). In accordance with the expert, the cluster system is nowadays one of the major coordination trends in humanitarian logistics. Case study research results support this by pointing to the merits and benefits of this coordination system [73]. Advantages of clustering the activities of different NGOs are highlighted by Jahre and Jensen [74], who describe the role of clusters for building global, central and local capacities, designating global coordination management and the provision of humanitarian aid when all other systems fail. Procurement clusters can overcome problems related to the distribution of procurement authorities and skills due to a clear division of expertise and assignment of NGOs to specific clusters. Examples mentioned by experts include clusters that exclusively focus on the procurement of sanitation and water purification material, medical supplies or housing equipment in order to avoid redundancy within each product category. Despite its power to reframe humanitarian coordination, several challenges are associated with the cluster concept. In this regard, results of the case study research point to a gap in predictable leadership, significant barriers to inclusive partnership and a general lack of sufficient mechanisms to enhance accountability to beneficiaries [75]. Nevertheless, the positive aspects are predominant, hence we propose that:

P3. Cluster coordination for specific relief items increases the effectiveness and efficiency of procurement, as NGOs pool their knowledge and expertise in procuring.

- Coordination platform: Coordinating procurement stakeholders by means of virtual platforms was proposed by the interview partners of cases 1, 2, 6 and 7. In general,



platforms enable humanitarian organizations to procure relief items from suppliers in a virtual marketplace where demand and supply are visible and transparent for all decision-makers. Web-based platform solutions are already in use, as in the case of some military units in the UN. Via these UN platforms, national militaries can procure relief items from other UN military members by cashless payment. Isolated platforms for health management in geriatric care can be found in smaller NGOs, but its acceptance by other NGOs is not yet given. A coordination platform which basically serves as a procurement instrument is already applied in case 2. Here, the platform connects procurement units at the federal level with each other in order to facilitate the exchange of information related to internal relief items' stocks and demand characteristics. The main idea is to improve NGO internal information flow quality and to foster resource efficiency by aggregating purchase order quantities, thus exploiting economies of scale. Another coordination platform for increasing the connectivity between humanitarian stakeholders was initiated by the founders of case 7. The advantages of platform coordination, i.e., enhanced information exchange, maximized transparency, etc., are realized by this online solution that facilitates global networking of humanitarian players. However, cooperative decision-making [76] is already performed in medical diagnostics and treatment in the form of expert boards, commissions, project groups, think tanks or multidisciplinary teams. Overall, it can be argued that this approach has been followed in complex and critical decision-making situations, where the single actors' decision-making horizon needs to be enriched by others [77]. As a consequence, decisions based on the integration of single actors' information and knowledge are generally of higher quality and efficiency, leading to a more satisfying state of beneficiaries' welfare in disaster regions. Consequently, we pose that:

- P4. Coordination platforms facilitate information exchange between responding humanitarian stakeholders, thus leading to decisions of higher quality.

## 6. Conclusions

Reported challenges and problems in coordinating the variety of stakeholders in relief items procurement led us to focus on this field of humanitarian logistics. The importance of mapping existing challenges in procurement coordination motivated us to conduct case study research, with experts from the field of relief items procurement in NGOs, start-ups and military forces. In doing so, the case-based research in this study brought to light novel insights that have not previously been communicated in academia. In detail, we developed a framework to generate new knowledge on challenges that hamper the effectiveness and efficiency in the very essential field of procurement coordination in RSCM. The overall results indicate that challenges in procurement coordination are many-sided, ranging from resistance to change and decision-making, information sharing inefficiencies, redundant needs assessment and multiple resource acquisition to inter-NGO-related discrepancies, represented by irregularities in dividing competences among NGOs. With this, we add to the emerging stream of research on supply chain coordination theory and humanitarian logistics procurement. Particularly, we specify on the trust component as a pillar of relationship theory in supply chain coordination by showing that competition constitutes a major challenge for the trust building process in procurement coordination. Competition is already described by Aldashev and Verdier [65], who argue that NGOs generally compete for scarce resources, i.e., donors. Our results underline this and show that competition is not only superficially present between organizations but deeply rooted in core processes of relief items procurement. We were also able to identify complex bureaucratic hurdles as another driver of untrusted partnerships in procurement coordination. This finding indicates that massive loads of administrative work negatively impacts trust and coordination performance in relief items procurement. This new insight can be taken into consideration when applying the resource-based view in the field of humanitarian logistics in future research [51]. Interestingly, we found that challenges are also existing within the

internal structure of NGOs, a fact that has not yet been documented in the literature so far. Specifically, the resistance to change of key decision-makers in charge of procurement causes several inefficiencies when organizing corresponding activities. Surprisingly, the partial unwillingness to share information is not only present between NGOs [78], but also existing between members within the same organization. This is highly problematic as the uncooperative behavior of certain stakeholders has far-reaching impacts on the overall efficiency of procurement coordination. Our findings further reveal that NGOs are lacking real-time inventory management systems and ERP systems, resulting in inefficient resource management and uncoordinated procurement activities between involved organizations. This is consistent with observations by others, e.g., Akhtar and Marr [17], indicating that the need to redesign resource management within NGOs is definitely given, as resource sharing represents a main motivation for horizontal coordination between humanitarian organizations [79]. Media attention represents another challenge that impacts coordination and communication among NGOs. As already discussed by Altay and Pal [20], we additionally found that single NGOs tend to avoid letting too much information disperse via media to have better control over their internal demand assessment. What they do ignore is that their disclosure of relevant demand information brings additional uncertainty and imbalance into the entire procurement and demand-satisfaction process. Other results of our study complement existing literature in the field of humanitarian logistics, as we exclusively focused on the challenges of procurement coordination through the lens of the DMC [4]. We uncovered the response phase as the period where the most challenges impede the efficiency of coordination processes between involved organizations. This can be a starting point for further analysis, where special attention is given on gathering the root causes for coordination challenges in the response phase of the DMC.

With our results, we sensitize practitioners for the negative impact that challenges have on the effectiveness and efficiency of overall relief items procurement. The identification of such impediments and challenges is the first step towards improving the current practical situation in procurement coordination. Procurement agents of NGOs can benefit from our findings, as they are made aware of the variety of challenges in coordination practice. Based on the findings, NGOs can start developing solutions for each problem field in order to regulate and structure procurement coordination processes. Such solution approaches can be represented by further results of our study comprising alternative coordination strategies for more efficient relief items coordination. The findings from the expert interviews indicate that social media integration, procurement flexibility, cluster and collaborative coordination may improve the performance of NGOs in coordinating procurement activities. These improvement strategies and ideas for innovative procurement coordination offer high potential for solving some of the above-described challenges and may lead to more coordinated procurement activities.

This study is constrained by several factors. First of all, we based our results on interviews with experts from NGOs of substantial size. However, as problems and challenges may be of a different nature within smaller NGOs and the study's aim is to follow analytical rather than statistical generalization, further research needs to be conducted focusing on the procurement activities of smaller humanitarian organizations. We are also aware that including experts from the supplier side would expand our results, which is of great importance for understanding the big picture of humanitarian procurement coordination. Another limitation represents the number of interviewees in our study, which numbers one per case. Interviewing more informants was not realizable because relevant positions (Head of Procurement, etc.) were occupied by just one individual in most cases, thus no other person could be interviewed. Additional future research may include the testing of propositions and comparison of identified improvement approaches with present coordination practice in order to scientifically investigate improvement potentials of cluster and collaborative (i.e., distributed decision-making) coordination. The integration of coordination platforms into the case sample enabled us to generate these interesting and valuable findings that push further developments of such alternative procurement approaches.

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## Appendix A. Interview Guide

1. General information
  - What is your educational background and work experience within the humanitarian sector?
  - Which position do you currently hold within the organization?
  - Which are your responsibilities and what is your role in the organization?
  - What is the focus of action and size of the organization?
2. Procurement process
  - How is the procurement process within the organization structured?
  - How are suppliers selected (order qualifying and winning variables)?
  - Which products are procured?
3. Procurement coordination
  - Which stakeholders are primarily involved in procurement coordination?
  - How are stakeholders in relief items procurement coordinated?
  - How do organizations share critical information?
  - How can relationships to other stakeholders be characterized?
  - What problems and challenges exist in current coordination practice?
  - Can you assign them to the stages of the disaster management cycle?
  - To which extent do challenges exist within and between organizations?
  - How do these problems and challenges impact the performance of procurement coordination?
4. Improvement strategies and alternative coordination approaches
  - Would you change the current coordination practice?
  - If yes, how can the current situation be improved?
  - Which alternative coordination approaches offer potentials to replace the current ones?
  - How did you learn of these innovative coordination approaches?
  - Do initiatives already exist that attempt to improve coordination performance?

Table A1. Examples of Coding.

Coding Dimension	Code	Coded Text
Preparedness	Different thinking in preparedness	“NGOs might have a different thinking in terms of their own operations and further a different thinking in emergency preparedness”. [C2]
Response	Complex bureaucratic hurdles	“They have to chase so much paper work! And you have humanitarian emergencies, you have large epidemics and you find at the front line have severe human resources constraints because you have too many people you know in the central ministry following so much paper work and you cannot pay the nurses anymore”. [C6]
	Artificial price inflation	“And then if you have a lot of NGOs on the ground and it can exploit the situation and the need is very high, so many people from outside try to take advantage of the situation and they are increasing the price, and bringing in bad quality and if there is no logistics for example if you take the situation of south Sudan”. [C2]
	Redundant resource acquisition	“Resources were bought in parallel. Every NGO bought their own land cruisers, their own generators. Duplication with every emergency”. [C7]
Inter-NGO	Unwillingness to share information	“During the refugee crisis, when I was part of the BMI, I experienced, how to say, that NGOs only deliver information between each other when they need something. And in general, this information is very disperse then”. [C5]
	Unwillingness to share information	“I mean, there are differences, that is clear, so in case of a disaster, in the response itself, there is almost no cooperation and information sharing between NGOs”. [C1]
Intra-NGO	Unwillingness to share information	“Within the organization, when I work at the headquarter in Vienna, I can see the big picture, but when I ask for more details at the operational level, information is often not available. People switch between positions and then its even harder to get the right information”. [C3]
Overall problems/ challenges	Resistance to change	“That indicates that the human component is still the biggest problem, people’s narrow-mindedness”. [C3]

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