Enhancing AAA capabilities in humanitarian supply chains through 4PL adoption

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Abstract

Purpose – This paper aims to explore the impact of fourth-party logistics (4PL) adoption on the agility, adaptability and alignment (AAA) capabilities within humanitarian supply chains (HSCs).

Design/methodology/approach – Semi-structured interviews with individuals from a large non-government organisation were combined with secondary data to assess the influence of 4PL adoption on AAA capabilities in HSCs.

Findings – The results indicate that HSCs exhibit some of the AAA antecedents but not all are fully realised. While 4PL positively affects the AAA capabilities of HSCs, its adoption faces challenges such as the funding environment, data security/confidentiality and alignment with humanitarian principles. The study suggests an AAA antecedent realignment, positioning alignment as a precursor to agility and adaptability. It also identifies three core antecedents in HSCs: flexibility, speed and environmental uncertainty.

Practical implications – The study shows the positive impact 4PL adoption can have on the AAA capabilities of HSCs. The findings have practical relevance for those wishing to optimise HSC performance through 4PL adoption, by identifying the inhibiting factors to its adoption as well as strategies to address them.

Originality/value – This research empirically explores 4PL's impact on AAA capabilities in HSCs, highlighting the facilitating and hindering factors of 4PL adoption in this environment as well as endorsing a realignment of AAA antecedents. It also contributes to the growing research on SC operations in volatile settings.

Keywords Humanitarian supply chains, Fourth-party logistics (4PL), AAA capabilities

Paper type Research paper

Introduction

While most supply chains (SCs) face disruption intermittently, humanitarian SCs (HSCs) are faced with these disturbances on a regular basis (Day *et al.*, 2012). HSCs are described as complex systems (Schiffling *et al.*, 2022) that frequently face issues with visibility, poor information sharing and a lack of collaboration (Dubey *et al.*, 2021). The complex and context-dependent challenges of coordination within HSCs are well documented (Jensen and Hertz, 2016; Jahre and Jensen, 2010), with HSCs having to transition from "dormant" to "action" in a short space of time (Kovacs and Tatham, 2009). As a result, the ability of these SCs to be agile, adaptive and aligned (AAA) is imperative to ensure optimum performance and ultimately save lives. Unfortunately, while HSCs incorporate some of the key AAA capabilities, several crucial elements are lacking. Previous research has found that even agility, which may seem a natural occurrence in HSCs given that they must react to environmental changes with very little warning, is only evident to a limited degree (Rasyidi and Kusumastuti, 2020). Consequently, HSC performance is often heavily criticised (Beamon and Balcik, 2008; Scholten *et al.*, 2010).

One suggested approach to enhancing HSC performance is through fourth-party logistics (4PL) providers who are tasked with coordinating and managing the entire SC. 4PL providers aim to deliver high-performing, comprehensive and integrated SCs by combining the resources, capabilities and technologies of several organisations across the SC (Abidi *et al.*, 2015). Sharing technology and information in this way allows all actors to make strategic decisions quickly, thereby improving the AAA capabilities of the entire SC (Lee, 2021). As such, 4PL adoption has the potential to become a serious option for those

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wishing to increase the AAA capabilities of their SCs. The use of 4PLs in HSCs is not without criticism; in their review of coordination in HSCs, Balcik *et al.* (2010) suggest that 4PL adoption is unsuitable for the humanitarian environment mainly because of the high levels of risk involved with implementing it across the entire HSC. However, other studies suggest that the potential benefits of 4PL adoption within HSCs outweigh these risks (Abidi *et al.*, 2015; Jensen, 2012).

This paper discusses the considerable cross-learning opportunities between commercial and humanitarian SCs (Jensen, 2012, Day *et al.*, 2012), by analysing the use of 4PLs in the commercial sector, its associated benefits and its potential for enhancing humanitarian responses. Drawing from literature and an empirical study, the paper discusses how the increased integration and visibility offered by 4PL adoption can significantly improve HSC performance, speed, flexibility and stakeholder relationships (Vivaldini *et al.*, 2008; Huiskonen and Pirtilla, 2002). Moreover, the study addresses concerns such as data security and the fear of relinquishing control, both of which are prevalent in discussions on 4PL adoption across both sectors (Vinay *et al.*, 2009; Hingley *et al.*, 2011; Maku and Iravo, 2013).

While recent studies have shown how new technologies such as blockchain and big data analytics can improve HSC performance (Baharmand *et al.*, 2021; Dubey *et al.*, 2022), few have investigated the impact of 4PL adoption on HSCs. Some suggest that 4PL adoption within HSCs could significantly improve HSC performance, but none have investigated how 4PL might increase the AAA capabilities of HSCs. Most of these studies focus instead on the use of clusters (Jensen, 2012; Abidi *et al.*, 2012; Dufour *et al.*, 2018) or humanitarian organisations (HOs) themselves acting as quasi-4PLs (Vega and Roussat, 2019). The broader studies are mainly based on literature reviews or document analysis (Balcik *et al.*, 2010; Jensen, 2012; Vega and Roussat, 2019), while those based on empirical data have a much narrower focus, such as Dufour *et al.*'s (2018) cost–benefit analysis of outsourcing logistics services to the United Nations Humanitarian Response Depot (UNHDR). Similarly, while there are studies that have investigated AAA capabilities within HSCs, most have focused on only 1 or 2 of these capabilities. For example, the framework by Dubey *et al.* (2021) examines the relationship between information alignment and collaboration with the aim of improving HSC agility, but it does not consider the adaptability capability. Jermsittiparsert and Pithuk (2019) modelled the relationships between adaptability and agility, as well as information technology (IT), mutual trust and flexibility, but neglected to include the alignment capability. Similarly, L'Hermitte *et al.* (2015, 2016) focused on conceptualising agility within HSCs without considering adaptability or alignment, whilst Kabra and Ramesh's (2016) model does not consider alignment. As a result, there are only a limited number of studies that address all three AAA capabilities within HSCs (Dubey and Gunasekaran, 2016; Jermsittiparsert and Kampoomprasert, 2019; Dubey *et al.*, 2015), and none of these consider the use of 4PL in the humanitarian environment. This paper aims to add to this body of research by considering how 4PL adoption can enhance all three AAA capabilities within HSCs. The research questions are as follows:

RQ1. Are HSCs an example of AAA SCs?

RQ2. Can 4PL enhance HSCs' AAA capabilities?

RQ3. Which inhibiting factors must be overcome to enable successful 4PL adoption within HSCs?

The paper begins with a literature review on the importance of AAA SCs, the context of HSCs and the role 4PL can play in increasing AAA capabilities. The methodology section highlights the data collection (through interviews with SC managers at non-governmental organisations [NGOs] and the UN Logistics Cluster) and the data analysis techniques. The findings are presented according to the three AAA capabilities and focus on factors required during 4PL adoption within HSCs and ways in which 4PLs can contribute to enhancing the AAA capabilities of HSCs. Finally, the discussion and conclusion provide answers to the research questions and detail the paper's contribution, implications and limitations.

Literature review

This section is divided into three subsections; firstly, a background to AAA SCs; secondly, a discussion of HSCs; and finally, a discussion on the role that 4PL can play in enhancing HSCs' AAA capabilities.

Agility, adaptability and alignment supply chains

The concept of AAA SCs was introduced by Lee (2004) who suggested that the best-performing SCs are those that are able to react quickly to sudden changes in supply or demand (agility), can modify how they operate as markets change and new strategies are identified over the longer-term (adaptability) and are able to align the interests of all SC members by sharing costs and benefits to maximise all parties' interests and therefore optimise SC performance (alignment). Studies have shown that all actors involved in AAA SCs benefit from increased levels of performance and competitive advantage (Whitten *et al.*, 2012; Alfalla-Luque *et al.*, 2018; Feizabadi *et al.*, 2019; Gligor *et al.*, 2020; Machuca *et al.*, 2021). Although written in 2004, Lee's AAA SC concept is perhaps even more valuable in today's highly turbulent SC environment, where SC disruptions are more commonplace and consequences more severe (Feizabadi *et al.*, 2019; Cohen and Kouvelis, 2021).

The AAA SC concept as described by Lee (2004) has been widely embraced by academics and professionals and has been described as seminal by numerous scholars (Gligor *et al.*, 2020; Mak and Shen, 2020). However, it is obvious that the SC environment has changed significantly 20 years from Lee's original work (Mak and Shen, 2020; Cohen and Kouvelis, 2021; Sodhi and Tang, 2021). Some scholars are critical of the anecdotal evidence used to initially establish the AAA concept (Gligor *et al.*, 2020), whereas others suggest there is a lack of clarity over the three dimensions (Alfalla-Luque *et al.*, 2018; Marin-Garcia *et al.*, 2018). Recent studies have attempted to extend Lee's (2004) model for the "new normal". For example, Escamilla *et al.* (2021) add two further capabilities to the AAA framework: accessibility (an organisation's ability to receive basic services supporting their operations) and affordability (an organisation's ability to offer lower prices to customers). They

suggest that organisations that focus on accessibility and affordability ensure they remain profitable whilst offering customers better prices. Similarly, Gligor *et al.* (2020) found that by adding market orientation and SC orientation to the AAA capabilities, firms can achieve even higher levels of organisational success. Meanwhile, Cohen and Kouvelis (2021) created their "RRR" framework whereby robustness enhances agility, resilience enhances adaptability and realignment replaces the previous information and economic sharing alignment ideas to improve SC performance. Finally, Sodhi and Tang (2021) suggest that the AAA SC framework should be extended with a focus on the triple bottom line to incorporate profit, people and planet, especially given modern consumers' increasing interest in SC sustainability practices.

Of the three dimensions, Lee (2004) stated that agility was the most important, as this capability allows SCs to quickly recover from the number of sudden shocks and emergencies they face (Charles *et al.*, 2010). However, Lee was clear that all three As were required if the SC was to provide sustained competitive advantage for all actors involved, a point that has been empirically proven by Whitten *et al.* (2012). Despite this, literature has focused on each AAA dimension individually, with only a small proportion of studies incorporating all three (Whitten *et al.*, 2012; Dubey *et al.*, 2018; Feizabadi *et al.*, 2019). While agility has received significant attention in the literature, adaptability and alignment have been neglected (Marin-Garcia *et al.*, 2018; Machuca *et al.*, 2021), highlighting the need for studies that investigate all 3 dimensions together.

Humanitarian supply chains – examples of agility, adaptability and alignment supply chains?

HSCs involve the planning, management and delivery of an efficient and cost-effective flow of goods and services, from the point of origin to the point of consumption by populations affected by humanitarian disasters (Tatham and Pettit, 2010). Numerous stakeholders are involved within an HSC, including government, military, international and local HOs, donors, private sector organisations and local communities (Maghsoudi and Pazirandeh, 2016; Vaillancourt, 2016; Espejo-Diaz and Guerrero, 2021). All of these actors must operate in a complex and highly uncertain environment, often characterised by unpredictable beneficiary needs, limited availability of actors and the disruption of basic infrastructure and services (Balcik *et al.*, 2010). Coordination between HSC actors in these high-pressure environments is extremely challenging (UNHCR, 2015), owing to the absence of a single authority entity that can force all actors to engage in coordination (Stephenson, 2005). A lack of clear roles among HSC stakeholders further compounds this issue (Jensen and Hertz, 2016), leading to poor planning, duplication of effort and miscommunication among actors, as well as increasing the risk of wasting time, resources and relief goods (Vaillancourt, 2016). Other barriers to effective HSC coordination include inadequate information sharing among actors, unreliable data, a lack of trust between stakeholders, competition between organisations for donor funding and the varying priorities of stakeholders (Balcik *et al.*, 2010; Tatham and Pettit, 2010). While recent research has highlighted how innovative technologies such as blockchain and big data analytics have the potential to address some of these challenges, most HSCs still struggle to overcome these issues (Baharmand *et al.*, 2021; Dubey *et al.*, 2022).

Given these wide-ranging challenges, it is perhaps unsurprising that HSC performance is a relatively understudied area (Abidi *et al.*, 2014; Patil *et al.*, 2021, 2022). However, some scholars have attempted to identify key performance metrics, including the cost of operations, the efficient and timely use of resources and the amount of aid delivered (Beamon and Balcik, 2008). Similarly, high-performing HSCs tend to be responsive (the ability to deliver what is required on time), agile (the ability to deliver goods easily and quickly) and flexible (the ability to adapt to changes in the magnitude of the disaster and the needs of victims) (Balcik *et al.*, 2010; Tatham and Pettit, 2010). HSC performance is also positively impacted by effective coordination, with sharing information and resources between the various stakeholders being seen as fundamental to any successful humanitarian response (Maghsoudi and Pazirandeh, 2016).

With these challenges and performance criteria in mind, it is clear that HSCs need to be agile, adaptive and aligned to ensure optimum performance. Previous scholars have discussed the issue of AAA capabilities within HSCs, some of which are shown in Table 1.

While all of the articles in Table 1 investigate HSCs, most only look at specific aspects of AAA SC capabilities; for example, L'Hermitte *et al.* (2016) do not extensively investigate adaptability or alignment angles of the AAA capabilities, Jermsittiparsert and Pithuk (2019) do not consider the alignment capability, L'Hermitte *et al.* (2015) do not consider the adaptability or alignment capabilities, Kabra and Ramesh (2016) do not consider the alignment capability, whereas Dubey *et al.* (2021) do not incorporate adaptability into their work. Charles *et al.* (2010) set out a model for assessing and improving the agility capabilities of HSCs, but their work focused solely on agility, not on adaptability and alignment. Most of the studies in Table 1 use quantitative research methods to produce a framework or model. Only one study uses qualitative interview data (L'Hermitte *et al.*, 2016), highlighting the difficulty of obtaining qualitative data in this field (Kunz *et al.*, 2017). The motivation for this paper, therefore, is to fill this gap by being the only paper that qualitatively investigates whether the use of 4PL could improve the AAA capabilities of HSCs.

In terms of assessing the AAA capabilities currently present within HSCs, Table 2 lists the antecedents required for each of the three AAA capabilities (as per Feizabadi *et al.*, 2019).

It is important to note that the above antecedents are based on AAA capabilities within commercial SCs; given the numerous differences between commercial SCs and HSCs, some of the antecedents presented in Table 2 are not relevant to HSCs. It is therefore necessary to adapt Feizabadi *et al.*'s (2019) work so that all antecedents are pertinent to HSCs; this is conducted through Table 3. Table 3 also highlights whether current HSCs possess each of the AAA antecedents, to assess if current HSCs can be considered AAA SCs. In Table 3, the "Description of Antecedent in HSC Environment" column uses literature to explain exactly why HSCs currently do (or do not) possess this particular antecedent. For example, Table 3 shows that HSCs do not possess the "Process Integration" antecedent; the reasoning for HSCs not having this particular antecedent is "Current

Table 1 Previous literature on AAA capabilities within HSCs

Study	Findings
Dubey and Gunasekaran (2016)	Proposed an AAA framework to aid in creating sustainable HSCs through interpretive structural modelling and confirmatory factor analysis
Dubey *et al.* (2015)	Produced a framework investigating the relationships between AAA, leadership and HSC performance through a survey questionnaire and confirmatory factor analysis
Dubey *et al.* (2021)	Produced a framework examining the relationship between information alignment and collaboration (with the aim of improving HSC agility) through a survey questionnaire and structural equation modelling Produced framework does not consider the adaptability capability
Jermsittiparsert and Kampoomprasert (2019)	Produced a model to investigate the relationship between agility, adaptability and alignment when designing sustainable HSCs using a survey questionnaire and structural equation modelling
Jermsittiparsert and Pithuk (2019)	Produced a model to explore the relationships between adaptability, IT, agility, mutual trust and flexibility of HSCs through a questionnaire survey and structural equation modelling Produced model does not consider the alignment capability
L'Hermitte *et al.* (2015)	Produced a model conceptualising agility within HSCs using Teece's dynamic capabilities model Produced model does not consider the adaptability or alignment capabilities
L'Hermitte *et al.* (2016)	Investigated relationships between strategic agility capabilities (being purposeful, being action-focused, being collaborative and being learning-oriented) and current HSC practice through face-to-face interviews and qualitative content analysis Analysis does not consider the adaptability or alignment capabilities
Kabra and Ramesh (2016)	Produced a model to investigate the relationships between IT utilisation, mutual trust, agility, flexibility, adaptability and HSC performance through a questionnaire survey and structural equation modelling Produced model does not consider the alignment capability

Source: Table created by authors

coordination activities between HSC actors proves to be extremely challenging (UNHCR, 2015) due to the absence of a single authority entity who can force all actors to engage in coordination (Stephenson, 2005) as well as the absence of information integration across the HSC as explained above".

Similarly, Table 3 shows that HSCs currently do possess the "Speed" antecedent; the reasoning for HSCs currently possessing this antecedent is "HSCs are renowned for their ability to respond to disasters with little or no warning (Oloruntoba and Gray, 2009; Whybark, 2007), often having to

Table 2 Antecedents of the three AAA capabilities of agility, adaptability and alignment for commercial SCs

AAA capability	Antecedents	Description
Agility	Demand management	Enhanced product or service differentiation
	Flexibility	Ability to respond to short-term and long-term changes
	Information integration	Syncing information between firms
	Process integration	Coordinated processes across supply chain members
	Speed	Ability to quickly respond
	Supply management	Improved efficiency with suppliers
	Visibility	Ability to detect changes, threats and opportunities
Adaptability	Flexibility	Ability to respond to short-term and long-term changes
	Process integration	Coordinated processes across supply chain members
	SC relationships	Ability to understand and meet expectations of firms in the supply chain
	Visibility	Ability to detect changes, threats and opportunities
Alignment	Conflict management	Ability to resolve inter-firm disputes
	Environmental uncertainty	Lack of clarity of the operating environment
	Information integration	Syncing information between firms
	Interdependence	Level of reliance between firms
	Power	Ability to influence another firm
	Process integration	Coordinated processes across supply chain members
	Quality, process improvement	Improved business processes to enhance quality outcomes
	Relationships	Ability to understand and meet expectations of firms in the supply chain
	Socialisation	Knowledge of other firms' social values
	Strategy, goal integration	Inter-firm coordination of business objectives
	Supply management	Improved efficiency with suppliers

Source: Table created by authors (adapted from Feizabadi *et al.*, 2019)

Table 3 Assessing HSCs based on the antecedents of the AAA capabilities within a humanitarian context

AAA capability	Antecedents	Description of antecedent in HSC environment	HSCs currently show this antecedent?
Agility	Demand management	Ability to offer differing products/services based on the unique characteristics of the disaster and the needs of the beneficiaries (Maon *et al.*, 2009; Tatham and Spens, 2011; Holguin-Veras *et al.*, 2012; Lu *et al.*, 2016)	✓
	Flexibility	Ability to respond to short-term and long-term changes. These can include changes to the resources required as the disaster unfolds (Ergun *et al.*, 2010; Herlin and Pazirandeh, 2012; Rasyidi and Kusumastuti, 2020), changes to the day-to-day working conditions owing to geographical conditions such as aftershocks or floods (Day *et al.*, 2012; Ganguly and Rai, 2016; De la Torre *et al.*, 2012) or changes to transportation options because of damage to infrastructure such as roads and ports (Hirschinger *et al.*, 2015; Kovács and Spens, 2009; Pedraza Martinez *et al.*, 2011; Apte *et al.*, 2016; Holguin-Veras, Jaller and Wachtendorf, 2012) to name just a few	✓
	Information integration	Sharing and syncing of information between the various HOs involved in the HSC and between the HOs and the commercial suppliers of goods and services. At present there is a lack of sufficient information systems throughout HSCs (Beamon and Balcik, 2008; Chandes and Pache, 2010a), with most HOs using a combination of several incompatible information systems (Overstreet *et al.*, 2011; Yates and Paquette, 2011) and standalone applications such as Microsoft Excel to conduct their critical day-to-day operations (Pettit and Beresford, 2005; Scholten *et al.*, 2010)	
	Process integration	Coordinated processes across all HSC actors. Current coordination activities between HSC actors prove to be extremely challenging (UNHCR, 2003) because of the absence of a single authority entity who can force all actors to engage in coordination (Stephenson, 2005) as well as the absence of information integration across the HSC as explained above	
	Speed	Ability to quickly respond. HSCs are renowned for their ability to respond to disasters with little or no warning (Oloruntoba and Gray, 2009; Whybark, 2007), often having to move from a dormant state to an active state in a matter of hours to save as many lives as possible (Kovács and Tatham, 2009)	✓
	Supply management	Efficient ordering from suppliers. As each disaster is unique, the type (and scale) of goods and services required during the humanitarian response are unknown beforehand (Tatham and Spens, 2011). This makes it difficult to create solid purchasing agreements with suppliers prior to a disaster occurring (Lu *et al.*, 2019). However, vast quantities of goods and services are required immediately after a disaster strikes, necessitating large order quantities which require virtually zero lead time (McLachlin and Larson, 2011; Vaillancourt, 2016). As a result, each humanitarian organisation must individually make assumptions over the type, quantity and location of the relief goods; this results in duplicate orders as well as over ordering of some goods and services and underordering of others (da Costa *et al.*, 2012; Kovács and Spens, 2007)	
	Visibility	Ability to detect changes, threats and opportunities. The lack of sufficient information systems (Beamon and Balcik, 2008; Chandes and Pache, 2010a) leads to a subsequent lack of accurate information across the HSC, reducing the visibility of key tasks such as inventory management and distribution (Maon *et al.*, 2009; Yates and Paquette, 2011). The key area of IT deficiency in HSCs is the ability to track and trace resources (Bealt *et al.*, 2016; Pettit and Beresford, 2009; Whiting and Ayala-Öström, 2009), which negatively impacts the ability to detect changes or threats to the humanitarian response	
Adaptability	Flexibility	Ability to respond to short-term and long-term changes. These can include changes to the resources required as the disaster unfolds (Ergun *et al.*, 2010; Herlin and Pazirandeh, 2012; Rasyidi and Kusumastuti, 2020), changes to the day-to-day working conditions because of geographical conditions such as aftershocks or floods (Day *et al.*, 2012; Ganguly and Rai, 2016; De la Torre *et al.*, 2012) or changes to transportation options because of damage to infrastructure such as roads and ports (Hirschinger *et al.*, 2015; Kovács and Spens, 2009; Pedraza Martinez *et al.*, 2011; Apte *et al.*, 2016; Holguin-Veras, Jaller and Wachtendorf, 2012) to name just a few	✓
	Process integration	Coordinated processes across all HSC actors. Current coordination activities between HSC actors prove to be extremely challenging (UNHCR, 2003) because of the absence of a single authority entity who can force all actors to engage in coordination (Stephenson, 2005) and the absence of information integration across the HSC as explained above	

(*continued*)

Table 3

AAA capability	Antecedents	Description of antecedent in HSC environment	HSCs currently show this antecedent?
	SC relationships	Ability to build strong relationships with other actors in the HSC. Given the high levels of competition present between HOs (for donations, resources and media attention) and the fact that the majority of them will not have met each other previously (Chandes and Pache, 2010a; Van Wassenhove, 2006), trust between HSC actors is generally low which limits the extent to which solid SC relationships can be formed (Chandes and Pache, 2010a, 2010b; Fawcett and Fawcett, 2013). Trust is further eroded by the high turnover of staff within HOs (Lu *et al.*, 2019) which exacerbates attempts to maintain strong SC relationships. Similarly, the highly irregular and unpredictable demand pattern within HSCs has an adverse effect on supplier relationship development which requires predictable demand, lead times and scope to be successful (Beamon and Balcik, 2008; Ilhan, 2011; Maon *et al.*, 2009)	
	Visibility	Ability to detect changes, threats and opportunities. The lack of sufficient information systems (Beamon and Balcik, 2008; Chandes and Pache, 2010a) leads to a subsequent lack of accurate information across the HSC, reducing the visibility of key tasks such as inventory management and distribution (Maon *et al.*, 2009; Yates and Paquette, 2011). The key area of IT deficiency in HSCs is the ability to track and trace resources (Bealt *et al.*, 2016; Pettit and Beresford, 2009; Whiting and Ayala-Öström, 2009), all of which negatively impacts the ability to detect changes or threats to the humanitarian response	
Alignment	Conflict management	Ability to resolve inter-firm disputes. The increased competition for donations results in HOs having to emphasise their own contribution to any disaster response, leading to self-interested behaviour that manifests in reduced communication and trust levels between actors as well as reduced cooperation and coordination throughout the HSC (Chandes and Pache, 2010a, 2010b; Fawcett and Fawcett, 2013) This has the tendency to increase conflict within the HSC, something that is unlikely to be resolved because of the absence of a single authority entity who can force all actors to collaborate effectively (Stephenson, 2005)	
	Environmental uncertainty	Lack of clarity of the operating environment. HSCs must operate in a highly uncertain environment (Ergun *et al.*, 2010). For instance, the time, location and magnitude of a disaster are extremely difficult to accurately predict as most disasters occur with little to no warning (Oloruntoba and Gray, 2009; Tatham and Spens, 2011; Whybark, 2007). There is no indication as to how many people will be affected by a disaster (Heaslip *et al.*, 2012; Scholten *et al.*, 2010), and different disaster types require different response activities and resources (Balcik *et al.*, 2010; Ilhan, 2011; Tatham and Rietjens, 2016). Similarly, demand volume and location fluctuate as the disaster unfolds (Ergun *et al.*, 2010; Herlin and Pazirandeh, 2012)	
	Information integration	Sharing and syncing of information between the various HOs involved in the HSC and between the HOs and the commercial suppliers of goods and services. At present there is a lack of sufficient information systems throughout HSCs (Beamon and Balcik, 2008; Chandes and Pache, 2010a), with most HOs using a combination of several incompatible information systems (Overstreet *et al.*, 2011; Yates and Paquette, 2011) and standalone applications such as Microsoft Excel to conduct their critical day-to-day operations (Pettit and Beresford, 2005; Scholten *et al.*, 2010)	
	Interdependence	Level of reliance between HSC actors. HOs operate in a form of co-opetition, as while they must compete for donations, they are also forced to cooperate as no one humanitarian organisation has access to the technical knowledge required to cover every scenario a potential disaster can throw up (Heaslip and Barber, 2014; Pettit and Beresford, 2009). Similarly, HSC actors must work together to obtain a better picture of the resources required after the disaster has hit, as it is highly unlikely that one humanitarian organisation will be able to accurately assess the needs of each victim across a wide geographic area (Lu *et al.*, 2016; Maon *et al.*, 2009)	✓
	Power	Ability to influence others in the HSC. Influence is a significant issue within HSCs, as donors hold the power, often restricting where and how their donations are used by funding individual missions or activities based on their own personal or political agendas (Day *et al.*, 2012; Tomasini and Van Wassenhove, 2009). They also demand to see tangible results on how and where their funds are making a difference, forcing HOs to spend donations as quickly and as visibly as possible (Abidi *et al.*, 2015; Perry, 2007; Scholten *et al.*, 2010; Van Wassenhove, 2006)	

(*continued*)

Table 3

AAA capability	Antecedents	Description of antecedent in HSC environment	HSCs currently show this antecedent?
	Process integration	Coordinated processes across all HSC actors. Current coordination activities between HSC actors proves to be extremely challenging (UNHCR, 2003) because of the absence of a single authority entity who can force all actors to engage in coordination (Stephenson, 2005) and the absence of information integration across the HSC as explained above	
	Quality, process improvement	Ability to continuously improve business processes to ensure quality outcomes Continuous improvement and quality management are severely lacking within HSCs, as donors often refuse to fund vital preparedness activities such as pre-positioning, training, purchasing agreements and SCM tools (Pazirandeh and Herlin, 2014; Pettit and Beresford, 2009; Sheppard *et al.*, 2013) and instead focus on short-term relief activities (Heaslip *et al.*, 2012; Kabra *et al.*, 2015; Kovács and Spens, 2007)	
	SC relationships	Ability to build strong relationships with other actors in the HSC. Given the high levels of competition present between HOs (for donations, resources and media attention) and the fact that the majority of them will not have met each other previously (Chandes and Pache, 2010a; Van Wassenhove, 2006), trust between HSC actors is generally low which limits the extent to which solid SC relationships can be formed (Chandes and Pache, 2010a, 2010b; Fawcett and Fawcett, 2013). Trust is further eroded by the high turnover of staff within HOs (Lu *et al.*, 2019) which exacerbates attempts to maintain strong SC relationships. Similarly, the highly irregular and unpredictable demand pattern within HSCs has an adverse effect on supplier relationship development which requires predictable demand, lead times and scope to be successful (Beamon and Balcik, 2008; Ilhan, 2011; Maon *et al.*, 2009)	
	Socialisation	Knowledge of other HSC actor's social values. HSC actors vary in size, structure, local presence, core capabilities and supply chain configuration and also have highly varying social values (Baldini *et al.*, 2012; Ilhan, 2011; Kovács and Spens, 2009; De la Torre *et al.*, 2012). This makes it difficult for HOs to fully understand the social values of other actors within the HSC, especially given the sheer number of organisations involved in any disaster response	
	Strategy, goal integration	Inter-organisational coordination of business objectives. Each HSC actor has their own strategies, goals and mandates, often leading to reduced collaboration within the HSC, particularly if there are disagreements around the priorities of the disaster response (Beamon and Balcik, 2008; da Costa *et al.*, 2012; Sandwell, 2011)	
	Supply management	Efficient ordering from suppliers. As each disaster is unique, the type (and scale) of goods and services required during the humanitarian response are unknown beforehand (Tatham and Spens, 2011). This makes it difficult to create solid purchasing agreements with suppliers prior to a disaster occurring (Lu *et al.*, 2019). However, vast quantities of goods and services are required immediately after a disaster strikes, necessitating large order quantities which require virtually zero lead time (McLachlin and Larson, 2011; Vaillancourt, 2016). As a result, each humanitarian organisation must individually make assumptions over the type, quantity and location of the relief goods; this results in duplicate orders as well as over-ordering of some goods and services and underordering of others (da Costa *et al.*, 2012; Kovács and Spens, 2007)	

Source: Table created by authors (adapted from Feizabadi *et al.*, 2019)

move from a dormant state to an active state in a matter of hours to save as many lives as possible (Kovacs and Tatham, 2009)".

According to Table 3, HSCs exhibit some of the AAA SC antecedents, such as their ability to offer differing products and services, their ability to respond to short-term changes after a humanitarian event occurs, their ability to respond quickly to a sudden-onset humanitarian situation, the lack of clarity in the environment they operate in, the high level of interdependence between actors in the HSC and the ability of some HSC actors to influence others. However, there are many other antecedents that HSCs do not currently possess. Therefore, while HSCs do meet some of the criteria of AAA SCs, there is still a large proportion of AAA capabilities that are not yet covered by HSCs.

Increasing humanitarian supply chains agility, adaptability and alignment capabilities: the case for fourth-party logistics

Outsourcing of SC management (SCM) functions to logistics service providers (LSPs) has increased and evolved over the past decade and ranges from outsourcing single functions to outsourcing the entire logistics function (Bowersox *et al.*, 2007). While originally seen as a strategy enabling organisations to focus on their core competencies and improve their competitive advantage (Mangan *et al.*, 2012), this approach soon created a significant issue; given that traditional LSPs (sometimes known as third-party logistics [3PL] providers) usually specialise in (and are responsible for) a single function or component of the SC, organisations were required

to coordinate the activities of numerous 3PL providers simultaneously (Vivaldini *et al.*, 2008).

The substantial time and resources required for managing this coordination forced organisations to look for a method of effectively managing these relationships. As a result, the concept of 4PL was born and numerous 4PL providers entered the market. Essentially, 4PL providers strategically coordinate a network of 3PLs and serve as a single point of contact for the entire SC (Fulconis *et al.*, 2016). To do this, 4PLs supply a number of services that aim to design, coordinate and manage the entire SC in an integrated and holistic manner (Zacharia *et al.*, 2011). The 4PL provider integrates all SC actors' systems allowing for increased sharing of information, improved inter-organisational communication and increased sharing of skills, capabilities and assets across the SC (Coyle *et al.*, 2003). 4PL can therefore be considered a "total" provider (similar to a coordination agency or "hub") that improves SC governance and performance (Kasperek, 2013).

The benefits of using 4PL providers include optimised product, information and material flow, reduced inefficiencies, increased SC agility, increased cost-effectiveness, improved competitive advantage and increased SC performance (Vivaldini *et al.*, 2008; Huiskonen and Pirtilla, 2002; Kasperek, 2013). Organisations can deal directly with one 4PL provider as the single point of contact for the entire SC (Gnyawali and Park, 2011). Using 4PL providers also reduces the transaction costs associated with buyer–seller relationships through use of advanced technologies for information exchange and communication (Bourlakis and Bourlakis, 2005). Improvements in strategic collaboration among SC stakeholders not only facilitate synergies and efficiencies but also reduce inter-organisational conflict and competition among stakeholders (Nicovich *et al.*, 2007). This promotes trust, cooperation and the longer-term relationships critical to sustaining competitive advantage (Wong and Karia, 2010). 4PL providers also offer their clients access to more advanced technologies (such as blockchain), which have the potential to further enhance trust and transparency across the entire SC (Baharmand *et al.*, 2021). From a resource-based view (RBV), studies have found 4PL to increase collective competitive advantage by harnessing the strength and potential of organisations' combined assets and to create superior outputs (Somsuk *et al.*, 2012).

Given the advantages offered by such a strategy, the application of 4PL concepts to HSCs has been widely investigated (Abidi *et al.*, 2015; Cozzolino *et al.*, 2017; Heaslip, 2015; Heaslip *et al.*, 2012; Jensen, 2012; Tatham and Pettit, 2010). Table 4 provides an overview of existing literature on 4PL use within HSCs. A majority of these studies are based on literature reviews or content analysis (Abidi *et al.*, 2012; Balcik *et al.*, 2010; Vega and Roussat, 2019) and where empirical data has been collected, the focus is on a specific scenario (Dufour *et al.*, 2018; Cruz-Castro *et al.*, 2019). Some of these studies also suggest that a specific HO (or a cluster of HOs) can assume the role of the 4PL as opposed to the use of a commercial provider (Jensen, 2012; Vega and Roussat, 2019). While many of these studies mention the potential benefits of 4PL use in HSCs, no study has yet looked at how 4PL could be used as a strategy to increase AAA capabilities within the HSC setting.

With this in mind, Table 5 extends the analysis of Table 3 showing Feizabadi *et al.*'s (2019) antecedents of the AAA capabilities (Columns 1 and 2), whether current HSCs possess each of the antecedents (Column 3) and how the adoption of 4PL within HSCs would allow HSCs to possess the antecedents they do not currently possess (Column 4). Where HSCs already possess a specific antecedent prior to 4PL adoption (shown in Column 3), the explanation in Column 4 shows how 4PL can help to enhance this antecedent and thereby further improve HSC performance. In this sense, Table 5 shows how 4PL can help HSCs to possess the AAA antecedents that they currently do not possess, and how 4PL

Table 4 Summary of previous literature on 4PL use in HSCs

Study	Approach and findings related to 4PL in HSCs
Abidi *et al.* (2012)	Produced a SWOT analysis based on extant literature showing significant potential for enhanced coordination and efficiency through 4PL use in HSCs. However, the study also warns of possible issues around transparency and trust, as well as image and donor support
Abidi *et al.* (2015)	Developed a framework for a fourth-party humanitarian logistics concept based on seven expert interviews. Concluded that 4PL can have a positive influence in complex disasters, identifying numerous key drivers for collaboration between HSC actors
Balcik *et al.* (2010)	Produced a literature review on coordination in HSCs, which mentions 4PLs. Assigns a high-risk cost to 4PL usage in HSCs and thus suggests they are unsuitable for the humanitarian environment
Cruz-Castro *et al.* (2019)	Developed a proposal for integrating 3PL and 4PL providers to improve humanitarian aid delivery in Mexico. Suggested this would avoid duplication of effort and ensure populations receive supplies they actually need. Highlighted the importance of this during the disaster planning process
Dufour *et al.* (2018)	Produced an in-depth empirical study of a case in Uganda focusing on outsourcing logistics services to the UNHRD. Produced a cost-benefit analysis of adding a regional distribution centre
Huang *et al.* (2015)	Produced a model to solve a fourth-party logistics routing optimization problem with uncertain delivery time under emergency conditions using uncertainty theory
Jensen (2012)	Produced a literature review of 4PL to improve our understanding of the role of humanitarian cluster leads. Suggested that the role of cluster leads partially matches the 4PL concept, but that clusters could improve their relationship management skills by implementing suggestions from the 4PL literature
Vega and Roussat (2019)	Produced a content analysis of HO reports suggesting that some HOs have the potential to act as 4PLs (especially in the areas of information technology, provision of transportation capacities and warehousing facility operations). Despite this, the study found that some HOs still outsource their logistics operations to commercial LSPs

Source: Table created by authors

Table 5 Assessing HSCs based on the antecedents of the AAA capabilities within a humanitarian context and highlighting how 4PL adoption would allow HSCs to possess the antecedents they do not currently possess

AAA capability	Antecedents	HSCs currently show this antecedent?	HSCs using 4PL show this antecedent?
Agility	Demand management	✓	✓ 4PL offers organisations a better understanding of end user requirements, due mainly to their ability to easily share up-to-date information across all actors in the SC (Christopher, 2005; Abidi *et al.*, 2015; Li and Deng, 2017). As a result, 4PL adoption allows organisations to further enhance their capability to deal with both differentiation and complexity in demand patterns (Skender *et al.*, 2017; Govindan *et al.*, 2016)
	Flexibility	✓	✓ A key advantage of utilising a 4PL provider is the improved forecasting the provider can offer to all SC actors (Saglietto, 2013; Win, 2008; Schramm *et al.*, 2019). As a result, 4PL adoption allows organisations to further increase their levels of flexibility when having to contend with the uncertainty associated with supply and demand irregularity (Frost and Sullivan, 2005; Win, 2008; Abidi *et al.*, 2015)
	Information integration		✓ 4PL providers offer the ability to distribute information across the SC, thereby allowing all actors access to the latest SC information (Christopher, 2005; Abidi *et al.*, 2015; Li and Deng, 2017). Similarly, 4PL providers offer organisations a single interface for communication with all other SC actors, thereby simplifying information exchange between them (Schramm *et al.*, 2019)
	Process integration		✓ The 4PL provider acts as a single point of accountability across the entire supply chain (Win, 2008; Abidi *et al.*, 2015), offering total supply chain integration by bringing together the resources, capabilities and technology of all SC actors thereby increasing SC coordination (Leina *et al.*, 2010; Büyüközkan *et al.*, 2009) as well as network optimisation (Saglietto, 2013; Win, 2008)
	Speed	✓	✓ By taking away substantial time and resources required for managing and coordinating their logistics activities, the 4PL provider allows organisations to focus more on their core competencies (Tian *et al.*, 2008; Qureshi *et al.*, 2007; Jensen, 2010; Hingley *et al.*, 2011; Chu and Wang, 2012), thereby further enhancing their ability to quickly respond to the ever changing operating environment
	Supply management		✓ 4PL provides customers with supplier information (including items offered, lead time, quality of service etc.) so that they can make strategic decisions on which suppliers to order from (Li and Deng, 2017). 4PL providers can even be permitted to automate the ordering process, sending orders to specific suppliers whenever they are required, thereby guaranteeing the supply of the right materials at the right time (Li and Deng, 2017). Improved forecasting (Saglietto, 2013; Win, 2008; Schramm *et al.*, 2019) and reduced costs due to their ability to obtain economies of scale (Fulconis *et al.*, 2007) have long been an advantage of using a 4PL provider Similarly, 4PL providers have a greater awareness of the external environment Stefansson, 2006; Saglietto and Cézanne, 2015a, 2015b); combining this with their use of data analytics (Wamba *et al.*, 2015; Wang *et al.*, 2016) allows them to learn from previous disasters, thereby increasing the accuracy of the relief goods required
	Visibility		✓ 4PL providers are known to have a greater awareness of the external environment and therefore can detect (and offer guidance and advice on) changes, threats and opportunities based on this proficiency (Stefansson, 2006; Cézanne and Saglietto, 2015). Similarly, utilising 4PL has been shown to decrease supply chain complexity (Bourlakis and Bourlakis, 2005; Saglietto and Cézanne, 2015a, 2015b) The use of data analytics technology by 4PL providers has also been suggested to increase visibility throughout the SC (Wamba *et al.*, 2015; Wang *et al.*, 2016)
Adaptability	Flexibility		✓ A key advantage of using a 4PL provider is the improved forecasting the provider can offer to all SC actors (Saglietto, 2013; Win, 2008; Schramm *et al.*, 2019). As a result, 4PL adoption allows organisations to further increase their levels of flexibility when having to contend with the uncertainty associated with supply and demand irregularity (Frost and Sullivan, 2005; Win, 2008; Abidi *et al.*, 2015)

(***continued***)

Table 5

AAA capability	Antecedents	HSCs currently show this antecedent?	HSCs using 4PL show this antecedent?
	Process integration		✓ The 4PL provider acts as a single point of accountability across the entire supply chain (Win, 2008; Abidi *et al.*, 2015), offering total supply chain integration by bringing together the resources, capabilities and technology of all SC actors thereby increasing SC coordination (Leina *et al.*, 2010; Büyüközkan *et al.*, 2009) as well as network optimisation (Saglietto, 2013; Win, 2008)
	SC relationships		✓ 4PL providers are able to build and continually improve successful SC relationships (Coyle *et al.*, 2003) As the 4PL provider acts as a single point of accountability across the entire supply chain (Win, 2008; Abidi *et al.*, 2015), they will be responsible for successful SC relationship development between actors, allowing other actors to focus on their core competencies (Hingley *et al.*, 2011). Similarly, the improved forecasting that 4PL offers (Saglietto, 2013; Win, 2008; Schramm *et al.*, 2019) will reduce the impact of irregular and unpredictable demand, thereby going some way to improving supplier relationship development
	Visibility		✓ 4PL providers are known to have a greater awareness of the external environment and therefore can detect (and offer guidance and advice on) changes, threats and opportunities based on this proficiency (Stefansson, 2006; Cézanne and Saglietto, 2015). Similarly, using 4PL has been shown to decrease supply chain complexity (Bourlakis and Bourlakis, 2005; Saglietto and Cézanne, 2015a, 2015b) The use of data analytics technology by 4PL providers has also been suggested to increase visibility throughout the SC (Wamba *et al.*, 2015; Wang *et al.*, 2016)
Alignment	Conflict management		✓ 4PL providers are well suited to manage SC conflicts both because of their role as the single point of accountability across the supply chain (Win, 2008; Abidi *et al.*, 2015) and their expertise in management consulting services (Skjoett-Larsen, 2000). Conflict is further reduced by the 4PL provider's ability to increase information sharing across the SC (Li and Deng, 2017). Their neutral positioning within the SC alongside their role as the SC's key decision-maker (Christopher, 2005) also allows them to resolve conflict more easily, with difficult decisions being made that benefit the majority of the HSC actors
	Environmental uncertainty	✓	✓ The increased IT infrastructure provided by the 4PL provider integrates actors across the SC, allowing for increased sharing of information, improved inter-organisational communication and increased sharing of skills, capabilities and assets across the SC (Coyle *et al.*, 2003). As a result, 4PL adoption allows organisations to further enhance their understanding of operations across the entire SC, thereby allowing better clarity of the operating environment (Christopher, 2005; Abidi *et al.*, 2015)
	Information integration		✓ 4PL providers offer the ability to distribute information across the SC, thereby allowing all actors access to the latest SC information (Christopher, 2005; Abidi *et al.*, 2015; Li and Deng, 2017). Similarly, 4PL providers offer organisations a single interface for communication with all other SC actors, thereby simplifying information exchange between them (Schramm *et al.*, 2019).
	Interdependence	✓	✓ 4PL adoption further enhances cooperation and coordination between all organisations across the SC. As the 4PL provider must act as the single point of accountability across the SC (Win, 2008; Abidi *et al.*, 2015), they effectively integrate all SC actors' information systems (Leina *et al.*, 2010; Büyüközkan *et al.*, 2009), thereby increasing interdependence between SC actors, as each actor must rely on the information given by all other actors for the SC to operate effectively and efficiently
	Power	✓	✓ 4PL providers can reduce the influence certain actors have on others within the SC because of both their ability to build and continually improve successful SC relationships (Coyle *et al.*, 2003) and their heightened role as the key coordinator across the SC (Win, 2008; Abidi *et al.*, 2015) Similarly, the 4PL provider is solely responsibility for SC innovations and process improvements (Christopher, 2005); this reduces the reliance on donors to fund such initiatives, thereby reducing

(*continued*)

Table 5

AAA capability	Antecedents	HSCs currently show this antecedent?	HSCs using 4PL show this antecedent?
			the influence they have Power issues can be further reduced by the 4PL provider's ability to increase information sharing across the SC (Li and Deng, 2017), allowing all actors increased transparency whereby power issues that were previously undetectable are now more clearly visible
	Process integration		✓ The 4PL provider acts as a single point of accountability across the entire supply chain (Win, 2008; Abidi *et al.*, 2015), offering total supply chain integration by bringing together the resources, capabilities and technology of all SC actors thereby increasing SC coordination (Leina *et al.*, 2010; Büyüközkan *et al.*, 2009) as well as network optimisation (Saglietto, 2013; Win, 2008)
	Quality, process improvement		✓ 4PL has been shown to improve the operations of actors involved in the SC (Hingley *et al.*, 2011) by establishing performance measurement and quality management systems (Abidi *et al.*, 2015) 4PL providers work with organisations to provide services that are unique and relevant to their needs, and are keen to build strong, long-term relationships with them (Schramm *et al.*, 2019) Therefore, the services the 4PL provider offers are likely to evolve over time, and it would be their responsibility to stay on top of these innovations/process improvements (Christopher, 2005), thereby reducing the reliance on donors to fund such initiatives. Similarly, 4PL providers regularly act as SC re-designers, re-aligning the SC to suit the current situation (Christopher, 2005)
	SC relationships		✓ 4PL providers are able to build and continually improve successful SC relationships (Coyle *et al.*, 2003) As the 4PL provider acts as a single point of accountability across the entire supply chain (Win, 2008; Abidi *et al.*, 2015), they will be responsible for successful SC relationship development between actors, allowing other actors to focus on their core competencies (Hingley *et al.*, 2011) Similarly, the improved forecasting that 4PL offers (Saglietto, 2013; Win, 2008; Schramm *et al.*, 2019) will reduce the impact of irregular and unpredictable demand, thereby going some way to improving supplier relationship development
	Socialisation		✓ The 4PL provider offers IT integration and a single IT infrastructure interface for all actors of the 4PL (Christopher, 2005; Schramm *et al.*, 2019), allowing all actors to easily identify others with the SC with minimal effort. By using a 4PL provider, HSC actors are more likely to understand the role each actor plays within the SC, allowing them to better understand other actors' social values Similarly, given that 4PL providers are tasked with building and continually improving SC relationships (Coyle *et al.*, 2003), SC actors' understanding of each other's social values will improve as their relationships develop
	Strategy, goal integration		✓ The 4PL provider can help actors across the SC to develop their shared strategies and goals (Jensen, 2010; Hingley *et al.*, 2011), as 4PL providers are treated as strategic partners as opposed to simply an outsourcing provider (Mukhopadhyay and Setaputra, 2006), whereby they offer management consulting services alongside the traditional SCM initiatives (Skjoett-Larsen, 2000)
	Supply management		✓ 4PL provides customers with supplier information (including items offered, lead time, quality of service etc.) so that they can make strategic decisions on which suppliers to order from (Li and Deng, 2017). 4PL providers can even be permitted to automate the ordering process, sending orders to specific suppliers whenever they are required, thereby guaranteeing the supply of the right materials at the right time (Li and Deng, 2017). Improved forecasting (Saglietto, 2013; Win, 2008; Schramm *et al.*, 2019) and reduced costs because of their ability to obtain economies of scale (Fulconis *et al.*, 2007) have long been an advantage of using a 4PL provider Similarly, 4PL providers have a greater awareness of the external environment Stefansson, 2006; Cézanne and Saglietto, 2015); combining this with their use of data analytics (Wamba *et al.*, 2015; Wang *et al.*, 2016) allows them to learn from previous disasters, thereby increasing the accuracy of the relief goods required

Source: Table created by authors (adapted from Feizabadi *et al.*, 2019)

can help to further enhance the antecedents that HSCs already possess. Table 5 clearly shows that owing to its ability to design, coordinate and manage the entire SC in an integrated and holistic manner, 4PL adoption would significantly increase the AAA capabilities of HSCs.

Methodology

This study used the in-depth interview method (Easterby-Smith *et al.*, 2012), with data being analysed using thematic analysis (Braun and Clarke, 2006).

Data collection

Semi-structured interviews were used to uncover issues and relationships that have not yet been explored in literature. Qualitative interview analysis is useful in situations where there is existing general knowledge of the research topic, but real-life context and practice are lacking (Ketokivi and Choi, 2014). Open-ended questions facilitated a free-flowing discussion around predefined concepts (VanScoy and Evenstad, 2015) and enabled theoretical elaboration by using real-life insights and experience to identify themes and behaviours (Yin, 2014). The open-ended approach allowed participants to talk about their experiences and discuss topics that may not have been anticipated or pre-defined by the researchers.

Sampling

Non-random, purposive sampling was used to select participants, ensuring that those most likely able to contribute to the research questions were interviewed (Staats *et al.*, 2011). Bias was controlled through clear selection criteria (Robinson, 2014), including that participants must have at least Three years' work experience in HSCs and experience of the United Nations Logistics Cluster as the primary coordination mechanism.

To identify participants, a database of logistics personnel of an NGO was reviewed (referred to as "NGO X"). NGO X is a large international NGO with operations and teams in over 30 countries. A total of 17 employees from NGO X met the sampling criteria and were contacted to take part in the research, with 6 individuals accepting the invitation. To find more participants, the UN Logistics Cluster coordinator in Syria was contacted and 4 additional participants were interviewed.

Online interviews with the 10 respondents lasted one hour on average. An interview guide was used to ensure consistency and minimise bias (Halldorsson and Aastrup, 2003). The interviews were transcribed and transcripts were shared with the respective participants to confirm the accuracy of the researchers' understanding of their responses and to identify and address any misinterpretations (Easterby-Smith *et al.*, 2012; Halldorsson and Aastrup, 2003). Any answers or concepts that were unclear to the research team were clarified with the respondents in a follow-up call.

Participant profiles

Table 6 provides a summary of study participants, including their demographic characteristics and work experience.

Data analysis

Thematic analysis was used to identify patterns, themes and relationships within the data (Braun and Clarke, 2006). A four-stage approach was adopted, as suggested by Braun and Clarke (2006). Using the literature review as a guide, key ideas were noted manually on general themes, concepts and words that emerged from the transcripts. A two-level coding process followed (Ellram, 1996); first through manual coding and secondly with help of the NVIVO software package, as recommended by Bazeley (2013) to finalise first-level codes. The first-level codes were grouped and arranged into a hierarchy of categories based on emerging relationships and themes. Finally, themes were reviewed using NVIVO's visual display functions. This combination of manual coding combined with the use of NVIVO has been shown to generate greater insights during the data analysis process, leading to a greater interpretative insight and ultimately a more rigorous analysis procedure (Maher *et al.*, 2018). Some categories were reorganised and themes and links between concepts were revised and refined.

Triangulation

The primary interview data was triangulated with secondary data from internal and external documents and reports gained from NGO X, as recommended by Saunders *et al.* (2019). Documents included evaluation reports, strategy documents, relevant meeting minutes and field reports. All documents were analysed using the process proposed by Bowen (2009). This triangulation allowed for internal validity of the emerging themes and findings from the interviews (Cresswell and Miller, 2000) and increased accuracy of data interpretation by reducing the potential for author bias (Mangan *et al.*, 2004, p. 569).

Findings

Key findings are presented according to the three AAA capabilities, focussing on the factors required during 4PL adoption within HSCs and how 4PLs can contribute to enhancing AAA capabilities.

Agility

Respondents stressed the importance of agility in HSCs, highlighting not only how crucial speed is for reaching those in need of supply but also how flexible HSCs need to be amidst constant changes. However, all respondents acknowledged the significant hurdles of bureaucracy and coordination inhibiting agility. This was regarded as a key area 4PLs could help to address through information and process integration. Participant #9 expressed that the promise of 4PL usage was "[. . .] definitely coordination. . .Making sure that there's regular meetings between agencies so agencies can share their plans and activities. . ."

Some were sceptical of the humanitarian sector's ability to provide a sufficiently agile environment for 4PLs to succeed. To combat bureaucracy (particularly the amount of time for approvals), participants suggested introducing "fast track" measures for the 4PL, such as simplified request requirements and one designated person to authorise all requests. Giving the 4PL provider this degree of autonomy was seen as beneficial by

Table 6 Interviewee profiles

Participant No.	Gender	Type of organisations employed at	Role	Seniority	Years of experience in HSCs
1	Male	NGO	Logistics Coordinator	Middle Management	8
2	Male	UN	Global Logistics Advisor	Senior Management	18
3	Male	NGO	Global Supply Chain Manager	Senior Management	15
4	Female	UN	Logistics Cluster Coordinator	Middle Management	10
5	Female	NGO	Logistics and Procurement Manager	Middle Management	11
6	Male	NGO	Logistics Manager	Middle Management	7
7	Female	UN	Supply Chain and Procurement Specialist	Middle Management	8
8	Female	UN	Head of Operations and Field Services	Senior Management	12
9	Male	NGO	Logistics Cluster Coordinator	Middle Management	9
10	Male	NGO	Regional Logistics Advisor	Senior Management	12

Source: Table created by authors

all participants. Participant #2 referenced the World Food Programme (2012) evaluation of the Global Logistics Cluster, which recommended simplified measures and faster processing activities that can be "activated" based on the scale, urgency and complexity of the humanitarian situation. The same participant stated that benchmarking the 4PL provider's performance would be important when, for example, agreeing on the minimum number of days required for a particular process or function. Participants felt that this bureaucracy would have a significant impact on the ability of a 4PL provider to manage the HSC effectively and efficiently; Participant #6 stated that the UN's requirement for multiple signatures through their approval process can make contracting for logistics service provision a "long-winded process". This process can take up to two months, even though effective emergency responses should occur within two weeks of a crisis. Dealing with a 4PL was regarded as a positive step in improving the speed of humanitarian responses if HOs can agree to less cumbersome processes.

Another potential inhibitor for successful 4PL use to enhance AAA capabilities is the challenge of humanitarian funding, which is donor-dependent and often erratic, with little continuity as most funding arrives in bursts in the immediate aftermath of high-profile disasters. Additionally, participants mentioned that donor funding is decreasing globally and highlighted "donor fatigue". The competition for funding, fragmented funding environment and high insecurity are seen to hamper inter-agency collaboration and coordination. Therefore, participants felt that 4PL adoption would be difficult, as the need for preparedness activities and longer-term solutions is not appreciated by funders who favour more visible activities over SC optimisation. According to Participant #7: "Donor funds are quite restrictive, short term and rigid about what it can be used for. So, there is no funding flexibility to do other tasks that may address an unanticipated humanitarian supply chain problem... I think to be effective, [...] more flexible, long-term funding is needed for strategic solutions".

One respondent suggested that to ensure 4PLs could do their work longer-term (and ensure the security of funding to tackle the wider issues of integrating processes and information flows) "there should be some kind of pooled funding for the logistics activities, they could then do so much more with many cost savings" (Participant #3). Participant #2 echoed this and said the introduction of a 4PL provider could initiate pooled funding and more integrated processes. A 4PL acting as a catalyst for much-needed change was cited as essential in enhancing the agility of HSCs.

A strong recurrent argument for 4PL use was the expected boost to information integration and resultant improved visibility along the HSC. Many participants felt the HSC would benefit from tools that: offered access to real-time data, had the ability to be easily adapted to any country's infrastructure, were full accessible to all stakeholders, and ensured robust security and privacy of all data:

> Participant #10: "If we had more graphic, real-time platforms easily accessible to all agencies and field locations it would help. To see for example the types of supplies and amount arriving in a certain location for one partner or delays [...] would help with agencies for contingency stock planning".

The lack of sufficient and consistent funding was seen as a key inhibiting factor for realising the potential benefits of 4PL adoption on information management. Participants suggested that the 4PL provider could consider cloud computing using the Software-as-a-Service model. Storing information like this would facilitate improved information sharing between parties, alleviating some of the coordination issues:

> Participant #5: "I think some sort of information repository for information on common issues rather than going back to last meeting minutes".

4PLs are seen as a way to achieve a level of information integration that would enhance the speed and flexibility of humanitarian responses.

Adaptability

IT also featured in the discussion of adaptability. Most participants felt that the current use of technology in HSCs was sub-standard and that better options were available to improve the HSC.

> Participant #7: "People in humanitarian sector [...] are not aware of the more updated and innovative technology and processes out there; it would help so much".

Participants felt that adopting newer technologies within the HSC would empower 4PL providers with increased visibility across the SC, allowing them to manage and coordinate more effectively.

However, some participants cited data security and confidentiality issues as reasons why visibility would have to be

carefully thought about in HSC and discussed in detail with any 4PL, as some humanitarian data, for example on refugees or vulnerable persons, is highly sensitive. Participants suggested the 4PL may have to manage this data separately in a specialised database that has increased security measures using systems that "address issues of privacy as some data can be sensitive and political where we work" (Participant #7). So, while the importance of visibility to HSCs is recognised, it has to be adapted to the humanitarian context.

Many staff in HSCs are provided with short-term contracts, leading to high staff turnover. This has a negative impact on the HSC in terms of leadership, coordination and engagement between stakeholders, all of which require long-term relationship-building activities to build trust and confidence between actors, something that is difficult to achieve if personnel keep changing:

> Participant #2: "people come and go all the time instead of having career development. They should offer people three to five-year contracts so they can stay and retain their skills".

Additionally, participants remarked that some personnel do not have adequate SC expertise and lack the interpersonal skills to lead their organisations and engage with other actors in the SC. Currently, relationships are seen to be negatively influenced by the constant change in priorities:

> Participant #4: "Each time [a new logistics coordinator takes over] it changes – 'ok, we're not doing trucking anymore, now we're gonna do training instead, now we're going to do x, y, or z'".

4PL providers were seen as a solution to both issues by providing the necessary continuity and expertise to maintain strong SC relationships.

Process integration with other stakeholders was seen as a barrier to improving AAA capabilities, especially the adaptability to different operating environments. Participants felt that personnel within their organisation tended to evade certain stakeholders, particularly private sector and governmental ones, to avoid corruption and bribes, maintaining the humanitarian principle of neutrality and complying with their organisational mandates and values. This mindset could be detrimental to the idea of 4PL, which requires all parties within the SC to be completely open and honest with the information they provide. Should a particular HSC stakeholder be seen to act in an inappropriate manner, all other stakeholders could easily become increasingly cautious, especially if they felt their information could be used against them. Participants stated that increased competition between HOs reduces trust and might result in stakeholders pulling out of any 4PL agreement, potentially leading to a domino effect whereby 4PL becomes unfit for purpose:

> Participant #8: "Building partnerships takes time, you need to constantly reach out, discuss, meet and build trust… Corruption and conflict of interest are big challenges depending on the stakeholders and country".

Nevertheless, participants saw potential for a 4PL to help in overcoming these barriers and facilitate better SC relationships and process integration.

Alignment

While alignment was seen positively, participants were concerned about losing control of resources to the 4PL provider and the impact on beneficiaries if the consolidated HSC were to be disrupted. Participants suggested using a risk management strategy, which includes a thorough risk assessment of the services provided by the 4PL for a given context. Participants suggested a method of ensuring the 4PL provider did not monopolise all HSC decisions; ensuring there is a minimum quorum of stakeholder organisations achieved for major decisions and actions concerning the 4PL would guarantee that different organisations' concerns and views were reflected and addressed. This highlights the importance of building and maintaining strong relationships in HSCs and successfully managing any arising conflicts. Information integration was highlighted as a crucial part of building trust in relationships with Participant #9 stating: "Technology can make humanitarian supply chain perhaps more organized, quicker, more efficient […] people would trust and know more what's going on and that will help with trust and collaboration".

The socialisation of the 4PL with the norms and values of the HSC was a concern. According to Participant #1 HSCs "need someone who is senior, respected, perhaps bit more savvy to engage on that level". Respondents hoped that 4PLs could provide such staff, especially over longer time horizons since "building partnerships takes time, you need to constantly reach out, discuss, meet and build trust" (Participant #8). Participants believed that careful recruitment of humanitarian personnel to the provider would be required:

> Participant #9: "For leadership, they need to recruit people who are motivating, convincing and credible for one. It's not just about someone who organises meetings and shares information, this person needs to see the bigger picture, like be proactive and make decisions that are not easy and challenge the status quo".

Participants suggested that trust was dependent on personal relationships between different personnel involved in the HSC. An individual's competence and interpersonal skills were considered important factors for credibility and respect, leading to an increase in trust between stakeholders. People skills being repeated across multiple participants were seen as crucial, especially regarding conflict management.

> Participant #2: "Getting people who know how to deal with those governments, someone who is credible and people believe and trust. Personality matters a lot in convincing and mobilizing people".

The services offered by the 4PL provider will depend on numerous factors, including the adequacy of funding, and the amount of autonomy other stakeholders in the HSC allow them to have. Many participants suggested a focus on procurement and SC activities that contributed towards the major issues affecting all organisations. Aligning supply management, improved efficiency with suppliers and integration of processes and information flows were seen as priorities. Participants suggested that during acute, large-scale humanitarian emergencies, additional resources should be allocated to the 4PL for further services.

While process integration was widely regarded as a good thing, interdependence was a worry. A major concern was the perceived "monopoly" the 4PL provider would have, as all stakeholders would be dependent on the provider for all logistics services. Should something go wrong with the 4PL provider, the entire HSC would be affected, having a detrimental impact on victims of the disaster:

> Participant #4: "you're going to create sort of a monopoly on resources and politically there's a lot of room for corruption".

Some participants were concerned about data privacy and security with integrated information, fearing that potentially sensitive information would become accessible to all stakeholders. Conversely, some felt that increased information transparency would increase equality throughout the HSC:

> Participant #9: "provide common assets and services on behalf of everyone so that there's some equity. So, the smaller organisations can still benefit from a good supply chain and not just the richer ones".

Respondents also highlighted that 4PL could provide an important monitoring function to ensure quality and create accountability across different organisation. Participant #1 stated "organisations are not really monitored or held accountable for what they do or don't do. We need to change that".

Participants valued integrating goals across various stakeholders in the HSC and highlighted the potential for improvement:

> Participant #7: "The 4PL could maybe work with government to set up a national logistics coordination body or platform involving wider stakeholders. [. . .] there is dialogue on issues and brainstorming potential solutions at least".

Participant #2 suggested that, where feasible, the 4PL provider should consider integrating, or piggybacking off existing government coordination bodies, to minimise the number of different meetings and platforms and ensure optimal participation by governments in 4PL activities. The 4PL provider should try to influence the agenda of national coordination meetings to ensure that key HSC issues are tabled and discussed regularly. Public–private partnerships were discussed by almost all participants to leverage the resources and knowledge needed from the commercial world to boost AAA capabilities and improve processes:

> Participant #3: "We should do more to work with private sector they seem to have amazing logistics. . .I feel humanitarian practices and systems are quite outdated, not up to par with commercial world".

> Participant #10: "They're [NGOs] still using technologies that are sort of obsolete comparing it to private sector. I think they've got to learn from the private sector first and especially in terms of the information management".

Discussion and conclusion

Enhancing agility, adaptability and alignment capabilities in humanitarian supply chains through fourth-party logistics use

Table 3 adapted the AAA antecedents identified by Feizabadi *et al.* (2019) to the humanitarian context and assessed whether HSCs currently exhibited these AAA antecedents. The results of this analysis allow us to answer *RQ1*; while HSCs currently exhibit some of the AAA SC antecedents, they lack the majority of them and therefore cannot currently be classified as AAA SC.

To answer *RQ2*, Table 5 used extant literature to show that 4PLs' ability to design, coordinate and manage the entire SC in an integrated and holistic manner (Zacharia *et al.*, 2011) would increase the AAA capabilities of HSCs. This result was subsequently confirmed in the findings section through the results of the semi-structured interviews; respondents had a positive disposition towards 4PL adoption within the HSC, expressing its expected ability to enhance AAA capabilities and improve the operational success of HSCs.

The respondents suggested that 4PL adoption was an important catalyst for change in the HSC, in particular focusing on its ability to coordinate the diverse actors involved (Zacharia *et al.*, 2011), integrate processes and information across the HSC (Maghsoudi and Pazirandeh, 2016) and act as a single point of contact (Gnyawali and Park, 2011), all of which could result in better supply management, simplified processes and enhanced flexibility and speed of the humanitarian operations (Abidi *et al.*, 2015). Acknowledging the diversity inherent within the sector (Maghsoudi and Pazirandeh, 2016; Vaillancourt, 2016; Espejo-Diaz and Guerrero, 2021), conflict management by a 4PL provider was also seen as a key advantage of 4PL adoption to significantly improve alignment within HSCs.

Another key theme was the building and maintaining of relationships across the HSC. This relates to empowering the smaller and less experienced organisations in the HSC as well as working more collaboratively with stakeholders that play a less immediate role (such as governments), particularly as interactions with these actors were frequently highlighted as challenging. One particular advantage of using a 4PL provider in this regard was seen to be their ability to liaise with all parties and integrate goals across stakeholders (Kasperek, 2013), ultimately improving HSC performance by eliminating duplication of effort, sharing best practice and improving SC relationships (Vaillancourt, 2016). Given the project-oriented nature of the humanitarian sector (alongside the high levels of staff turnover and the prevalence of short-term employment contracts), a lack of continuity was cited as a key inhibiting factor to maintaining strong relationships across the HSC. High staff turnover is a well-documented challenge in HSCs (Sheppard *et al.*, 2013; Tatham and Spens, 2011) and was highlighted by Lu *et al.* (2019) as an inhibitor of staff training. Using a 4PL provider as a single point of contact (Fulconis *et al.*, 2016) was therefore expected to foster longer-term SC relationships and enhance operational performance across the HSC (Vivaldini *et al.*, 2008; Huiskonen and Pirtilla, 2002).

The third key theme was the skillset 4PL providers could bring to the humanitarian sector (Kasperek, 2013). It was frequently acknowledged that logistics and strategic SC skills were lacking among humanitarian staff and that this was a key area where 4PLs could contribute to the humanitarian sector. Respondents acknowledged the significant cross-learning potential provided by practices used in the commercial sector (especially the strong use of IT to increase SC optimisation) and regarded this as a strong argument when considering 4PL adoption (Jensen, 2012, Day *et al.*, 2012). The use of more sophisticated IT was seen as crucial for enhancing visibility along the HSC and essential for achieving AAA status (Lee, 2021). Requirements for better SC visibility have grown in recent years (Maghsoudi and Pazirandeh, 2016) and the respondents showed that those in the humanitarian sector are aware that commercial SCs have progressed much further in achieving it. Integrating information flows across actors (Coyle *et al.*, 2003) and achieving proper visibility along the HSC could result in significant performance improvement (Vivaldini *et al.*, 2008; Huiskonen and Pirtilla, 2002) regarding the speed

and flexibility of the humanitarian response, as well as improved relationships across the HSC.

Inhibiting factors of successful fourth-party logistics adoption within humanitarian supply chains

RQ3 concerned the inhibiting factors that need to be overcome to enable a successful 4PL adoption within HSCs. Overall, 4PL use in HSCs is seen as a promising endeavour for performance improvement (Abidi *et al.*, 2015; Jensen, 2012; Tatham and Pettit, 2010). However, respondents highlighted several issues that must be resolved for successful 4PL adoption within the humanitarian environment. These were regarded as serious inhibiting factors and as such it can be expected that 4PL adoption in the humanitarian sector will not proceed until they have been overcome. As such, the following five inhibiting factors should be considered carefully when adopting 4PLs within HSCs for the adoption to be successful. Future research should aim to explore these factors in greater depth.

Funding

Fundamentally, any project as complex as the adoption of 4PL within the HSC will have to be appropriately funded. Respondents questioned whether the underlying funding structure of HSCs was conducive to this, given that funding fluctuates significantly and the majority of it is frequently earmarked for specific initiatives, as documented in previous studies (Schiffling *et al.*, 2022; Besiou *et al.*, 2014). Funding for activities that are less visible to donors, or not directly contributing to the well-being of recipients, is often scarce and there is increasing scrutiny on spending and outcomes (Moore and Taylor, 2011), with organisations asked to report on their activities in great detail to ensure funding reaches the intended recipients (Schiffling *et al.*, 2022). While such scrutiny is important, it can prevent spending on activities that may have an overall, longer-term benefit but whose value is not immediately quantifiable. To reap the benefits of 4PL use (and create a AAA HSC), funding would need to be secured for an extended period; this would ensure sufficient time to make the required changes, particularly in terms of building SC relationships and integrating information and processes, both of which require sustained commitment.

Bureaucracy

Secondly, respondents suggested that the significant bureaucracy within the humanitarian sector, which is explored in the literature (Kunz and Reiner, 2016; Pedraza-Martinez and Van Wassenhove, 2013), would act as a hindrance to 4PL adoption. Ultimately, a 4PL provider would provide the single point of contact to connect numerous other service providers, thereby reducing the administrative burden and the lengthy sign-off procedures, ultimately speeding up HSC operations (Fulconis *et al.*, 2016). However, while these benefits are obviously appealing, respondents expressed concern regarding the autonomy of the 4PL, particularly in terms of the number and type of decisions that could be outsourced to the 4PL before HSC actors effectively gave up control over their operations. Respondents felt that some of their operations were too crucial and too sensitive to be given over to a commercial provider.

Socialisation/morality

Respondents felt that the socialisation of the 4PL provider would be a key factor when deciding whether the 4PL adoption should go ahead (see also van de Vijver *et al.*, 2011). The humanitarian sector operates within strict moral boundaries in oftentimes highly political environments that directly affect the lives and livelihoods of recipients, their communities and entire nations. Respondents felt that maintaining the humanitarian principles (van Wassenhove, 2006), especially neutrality, while working with a 4PL would be particularly difficult. Previous studies highlight the difficulties of maintaining neutrality when working with military actors (Pettit and Beresford, 2005; Heaslip and Barber, 2014). This finding indicates that these concerns also pertain to commercial actors, as allowing a commercial service provider to be responsible for the coordination of the entire HSC could compromise this principle. Ultimately, breaching the principle of neutrality would result in an inability to gain access to those in need, putting lives at risk and undermining the *raison d'être* of the humanitarian sector.

Data security

Fourthly, concern for recipients was voiced throughout the interviews, but particularly regarding data security and confidentiality. The humanitarian sector handles highly sensitive personal information on vulnerable people (Dubey *et al.*, 2021), and any breach of confidentiality puts lives at risk and undermines the work of a humanitarian organisation, if not the humanitarian sector as a whole (Iqbal and Ahmad, 2022). Despite the acknowledged cross-learning potential (Day *et al.*, 2012) offered through 4PL adoption (particularly regarding IT), participants highlighted grave concerns about allowing humanitarian data to be handled by commercial partners, specifically because of the potential risk of data breaches. Data security in humanitarian responses is a growing area of interest in both academic and practitioner circles and this study highlights how crucial these endeavours currently are.

Loss of control

Fifthly, while respondents acknowledged the diverse potential benefits of 4PL adoption, they expressed concern about creating a dependence. The core concept of 4PL involves the ability to coordinate multiple actors within a SC (Zacharia *et al.*, 2011; Coyle *et al.*, 2003), leading to any 4PL provider having significant control over the SCs they participate in. The chief concern voiced was that the 4PL provider could potentially monopolise all decisions without having nuanced knowledge of humanitarian operations. In this regard, participants stressed the importance of conversing with diverse stakeholders to make the most appropriate decisions during humanitarian responses, particularly given the often sensitive work that HOs must conduct. Not only does this tie into issues highlighted in the other inhibiting factors (such as the growing area of research in data security within HSCs), it also echoes concerns about a loss of control in the literature on 4PL usage in the

commercial sector (Vinay *et al.*, 2009; Hingley *et al.*, 2011; Maku and Iravo, 2013).

Realigned agility, adaptability and alignment antecedents within humanitarian supply chains

This paper has demonstrated that 4PL adoption can enhance AAA capabilities in HSCs, although there are several issues that must be addressed. This study initially considered Feizabadi *et al.*'s (2019) original alignment of AAA antecedents to one of alignment, agility and adaptability. However, it was evident in the analysis that there was considerable overlap between the three As when considering the antecedents. This is in accordance with Feizabadi *et al.*'s (2019) proposed realignment of AAA antecedents (Figure 1).

In the proposed realignment, alignment is regarded as an antecedent to agility and adaptability. Agility as a consequence of alignment has previously been examined (Droge *et al.*, 2004; Handfield *et al.*, 2015), and Feizabadi *et al.* (2019) suggest that alignment is an antecedent to adaptability as the SC "is only as adaptable as its least adaptable member, advocating alignment as an antecedent to adaptability" (p. 282).

This was evident in the present study as, for example, process integration is seen as an antecedent to process improvement while improved relationships is an antecedent to better supply management. Given that the focus of this study was on 4PL adoption, the prevalence of concepts related to alignment is unsurprising. However, in the case of HSCs, this relationship is slightly different. Rather, any AAA HSC stems from a nucleus of antecedents that are inherent in the operational environment and form the core of why HSCs exist and how they differ from commercial SCs. This nucleus of antecedents consists of flexibility, speed and environmental uncertainty (see Figure 2). All other antecedents are influenced by and arise from these. All AAA capabilities aim to reinforce the ability to handle environmental uncertainty, the flexibility to respond to it and the speed to deliver vital goods and services to recipients to fulfil the ultimate purpose of HSCs. Our proposed realignment of AAA antecedents in HSCs is shown in Figure 2.

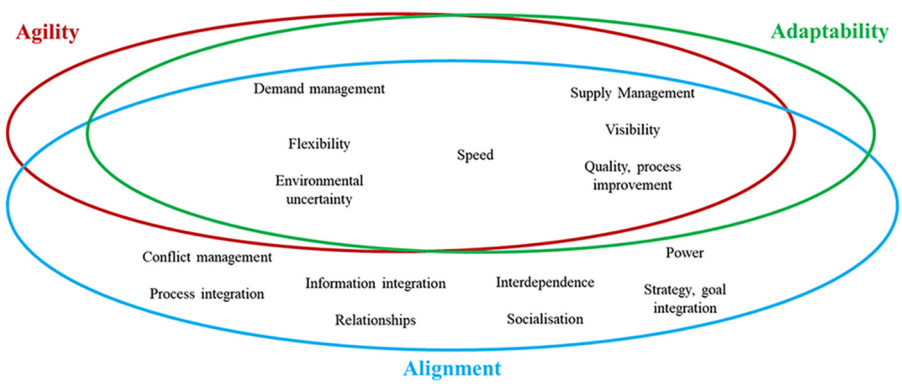
Consequences of agility, adaptability and alignment capabilities in humanitarian supply chains

Given the proposed realignment, it is important to highlight the benefits for enhancing AAA capabilities within HSCs. Feizabadi *et al.* (2019) outlined a series of AAA consequences based on a review of the extant literature. These consequences highlight the benefits that SCs will obtain once they become AAA. Table 7 extends this analysis to show the consequences that HSCs will benefit from should they use 4PL to improve their AAA capabilities.

Strategies for adopting fourth-party logistics within humanitarian supply chains

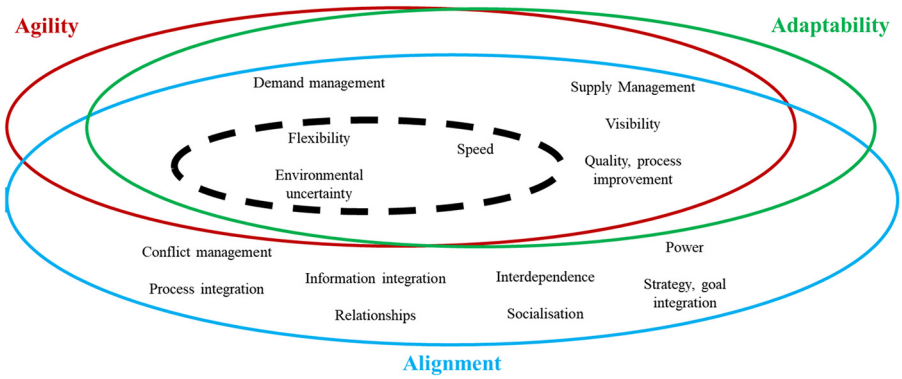
This study has shown how 4PL adoption within the humanitarian context can improve the AAA capabilities of the HSC. While the exact strategies used by the HSC to adopt 4PL is beyond the scope of this paper, there are several recommendations from the literature that should be considered. Bentz and Kammerer (2014) suggest starting the process of 4PL adoption by examining the existing SC and identifying both areas of underperformance and areas for improvement. To do this, Mehmann and Teuteberg (2016) propose a structured activity of process reengineering; here, individual organisations within the SC should simulate the current logistics process against the "target" logistics process to identify the improvements that can be made through the 4PL approach. This step ultimately ensures buy-in and justification of the 4PL adoption across SC actors, a theme that has been found to be important in the literature (Saglietto and Cézanne, 2015a, 2015b) and something that would be clearly beneficial within HSCs given the results of the present study's interviews. With the specific SC requirements understood, Papadopoulou *et al.* (2013) highlight the importance of selecting the most appropriate 4PL provider to meet these requirements. To aid in this pre-selection phase, they propose a framework for selecting the most appropriate 4PL provider to suit the needs of the SC. Once the 4PL has been adopted, Win (2008) proposes a conceptual model to assess the value that the 4PL provider is contributing to the SC, to assess its performance over time.

Figure 1 Proposed realignment of AAA antecedents



Source: Figure created by authors (adapted from Feizabadi *et al.*, 2019)

Figure 2 Proposed realignment of AAA antecedents with the nucleus of antecedents in HSCs



Source: Figure created by authors (adapted from Feizabadi *et al.*, 2019)

Practical and theoretical implications

In terms of practical implications, this paper has identified the specific antecedents required by HSCs for them to be classified as AAA SCs. It has also assessed HSCs in terms of their current AAA SC capabilities and highlighted the antecedents that HSCs need to work on to improve their AAA capabilities, thereby giving practitioners in the humanitarian field suggestions as to how they can improve their operations. The study has clearly showed that 4PL adoption is one such improvement that can increase HSC's AAA capabilities and therefore improve the efficiency and effectiveness of humanitarian operations. The findings have also shown the factors that may inhibit 4PL adoption within HSCs, whilst also creating a set of guidelines for 4PL adoption within HSCs based on findings from the literature. In this regard, the paper should act as a motivator for those working within HSCs; humanitarian practitioners should be encouraged to look further into exactly how this particular strategy could be successfully adopted within their field. Similarly, given that commercial SCs are facing ever increasing disruptions in the "new normal" we now live in, practitioners working in commercial SCs can benefit from this increased understanding of how 4PL can improve SC performance provided by this paper.

The paper also has a number of theoretical implications. Firstly, it has extended Feizabadi *et al.*'s (2019) AAA antecedents by adapting them for the humanitarian context; Table 3 in particular highlights the various antecedents

Table 7 Consequences of the AAA capabilities

AAA Capability	Antecedents	HSC	HSC with 4PL	Consequences
Agility	Demand management	✓	✓	• Improved financial performance • Improved operational performance • Stronger SC relationships
	Flexibility	✓	✓	
	Information integration		✓	
	Process integration		✓	
	Speed	✓	✓	
	Supply management		✓	
	Visibility		✓	
Adaptability	Flexibility	✓	✓	• Improved customer satisfaction • Improved innovation • Improved financial performance • Improved operational performance
	Process integration		✓	
	SC relationships		✓	
	Visibility		✓	
Alignment	Conflict management		✓	• Increased agility • Improved customer value • Increased information integration • Improved innovation • Improved aggregate performance • Improved financial performance • Improved operational performance • Increased process integration • Quality and process improvements • Improved SC relationships • Increased shareholder value • Enhanced sustainability
	Environmental uncertainty	✓	✓	
	Information integration		✓	
	Interdependence	✓	✓	
	Power	✓	✓	
	Process integration		✓	
	Quality, process improvement		✓	
	SC relationships		✓	
	Socialisation		✓	
	Strategy, goal integration		✓	
	Supply management		✓	

Source: Table created by authors (adapted from Feizabadi *et al.*, 2019)

required of HSCs for them to reap the benefits of AAA capabilities (which are subsequently shown in Table 7). The study has also added to the HSCM literature by showing how 4PL can improve its AAA capabilities. Previous scholars have discussed the issue of AAA capabilities within HSCs, with Table 1 highlighting the most appropriate. However, most of the studies identified in Table 1 only look at specific aspects of AAA SC capabilities (in other words, not all aspects of AAA are examined), and none of the studies investigates the use of 4PL as a strategy to increase the level of AAA capabilities within the HSC setting. This paper fills this gap by investigating whether the use of 4PL could improve the AAA capabilities of HSCs.

Limitations and further research

This study explores the feasibility and potential impact of future 4PL adoption on HSCs to enhance their AAA capabilities. The consequences of AAA capabilities in HSCs warrant further empirical research, with future studies potentially exploring the ultimate performance impact (Mackelprang *et al.*, 2014). Furthermore, studies which explore a wider range of perspectives on both 4PL use and AAA capabilities within HSCs would add to the body of knowledge, as the present study is limited by its sample size and its focus on the humanitarian organisation and UN perspective. It would be desirable to research the perspectives of diverse actors along the entire HSC. Future research could also pursue the extension of AAA to incorporate the two further capabilities added by Escamilla *et al.* (2021): accessibility (an organisation's ability to receive basic services supporting their operations) and affordability (an organisation's ability to offer lower prices to customers). Finally, future research could extend the analysis conducted by this study by further testing the antecedents identified here. One such suggestion would be to assess how far HSCs currently possess each of the antecedents; for example, it may be that HSCs have implemented some parts of a particular antecedent, but there is still some way to go for them to possess it completely. Charles *et al.* (2010) created a model for assessing agility within HSCs; creating a similar model for all three elements of AAA SCs would allow for an assessment of how close HSCs currently are to achieving each of the antecedents when compared with their commercial sector counterparts.

This study has contributed to the literature on AAA capabilities within HSCs and on 4PL adoption within HSCs. It supports the realignment of AAA antecedents as proposed by Feizabadi *et al.* (2019) and introduces the concept of the nucleus of antecedents in highly uncertain and changeable SCs. Although this study has focused on HSCs, the heightened disruptions caused by recent events, such as the Suez Canal blockage, climate change-induced droughts closing key inland waterways and the COVID-19 pandemic, have exposed the vulnerability of all types of SCs and highlighted the importance of developing SC resilience to manage disruptions and support recovery efforts (Chowdhury *et al.*, 2021). AAA capabilities can achieve the necessary responsiveness (Richey *et al.*, 2022). As the consequences of SC disruption can be significant (Worley and Jules, 2020; Rao *et al.*, 2021), there is a growing need for further research in this area to enhance SC performance and manage disruptions effectively.

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