



BUILDING ORGANISATIONAL CAPACITY TO SUPPORT OPERATIONAL AGILITY IN HUMANITARIAN LOGISTICS

Cécile L'Hermitte

BBus and MBus in International Trade

MA in International Relations

MBA in Maritime & Logistics Management

Supervisors:

Marcus Bowles

Peter Tatham

Benjamin Brooks

Submitted in partial fulfilment of the requirements for the Degree of Doctor of Philosophy
University of Tasmania, Australian Maritime College
November 2015

ABSTRACT

Humanitarian organisations operate in very complex and dynamic environments. In such environments, supply chain agility has been repeatedly recognised as an essential requirement. Agility enables humanitarians to swiftly respond to changes and disruptions encountered along the disaster relief supply chains. As humanitarian organisations are involved in multiple operations and, therefore, in multiple ad hoc supply chains, agility also enables them to move from one operational environment to another in an effective manner.

The purpose of this research is to increase and deepen the understanding of the concept of agility in humanitarian logistics. In particular, this study aims to demonstrate (1) that agility is a built-in characteristic of humanitarian organisations that transcends the operational, technical and functional levels, and (2) that it is required in contexts other than emergency responses. In other words, this study not only investigates the strategic antecedents of agility in humanitarian logistics, but also considers the applicability of agility to humanitarian protracted operations (longer-term and regular operations). In doing so, this research addresses critical limitations of the current humanitarian logistics literature on agility which is firmly rooted in operational level considerations and primarily associates agility with emergency disaster relief.

Systems theory and the dynamic capabilities model were used and, in parallel, the literature on agility in a business context was reviewed. Through this analysis, four strategic level agility capabilities were identified: (1) being purposeful, (2) being action-focused, (3) being collaborative, and (4) being learning-oriented. By undertaking a qualitative content analysis of 29 face-to-face interviews with key informants, the relevance of these capabilities to the humanitarian context was confirmed. An emergent relationship between the four capabilities and operational agility, i.e. the ability of humanitarian organisations to conduct responsive and flexible logistics operations, was also identified. Subsequently, the strength of this relationship was quantified by using structural equation modelling to conduct an analysis of survey data. This demonstrated that the above-mentioned capabilities form an integrated whole and that, collectively, they account for 52% of the variance in operational agility. Therefore, limiting supply chain agility to the operational level is suboptimal, i.e. agility requires high-level leadership inputs as well as a system-wide and aligned approach.

In addition, the logistics and supply chain environment of humanitarian protracted operations was investigated by collecting and analysing qualitative and quantitative data on the characteristics of such operations, the risks and uncertainties most frequently encountered, their impact, and the ways that field logisticians manage

disruptions. Through this analysis, it was demonstrated that unpredictability and disruptions exist in the logistics environment of protracted operations and, thus, that agile practices are also needed in such operations, i.e. beyond emergency responses.

This study opens new avenues for research and highlights the need for academics involved in the humanitarian logistics discipline to expand the scope of their research on agility (1) from a narrow focus on immediate action to a broader one that considers the organisational mechanisms that support immediate action, and (2) from emergency responses to the recovery phase of a disaster. This study also provides new theoretical insights and, in particular, develops the foundations of the theory of organisational agility in humanitarian logistics. Going one step further, this research informs the decisions and actions of the leaders of humanitarian organisations by providing the basis for a practical approach to the development of agility through the achievement of deep-rooted capabilities. Thus, it emphasises the need for leaders to be agility facilitators, i.e. to create an enabling environment that supports field work.

In the context of increasing humanitarian complexity, a growing number of long-term, recurrent and severe crises, rising demand for humanitarian assistance, and the limited funding available, it is more necessary than ever that humanitarian organisations reappraise the way they operate. Therefore, this research redefines the boundaries of the concept of agility in humanitarian logistics and opens up new perspectives on ways to increase the responsiveness and flexibility of field operations through an organisational approach.

DECLARATION OF ORIGINALITY

This thesis contains no material which has been accepted for a degree or diploma by any tertiary institution and, to the best of the Candidate's knowledge and belief, no material previously published or written by another person except where due acknowledgement is made in the text of the thesis. The thesis does not contain any material that infringes copyright.

Date: 10/11/2015

Cécile L'Hermitte

STATEMENT OF ETHICAL CONDUCT

The research associated with this thesis abides by the *Australian Code for the Responsible Conduct in Research* (2007) and the *National Statement on Ethical Conduct in Human Research* (2007).

Date: 10/11/2015

Cécile L'Hermitte

STATEMENT REGARDING PUBLISHED WORK AND AUTHORITY OF ACCESS

The publishers of the papers comprising Chapter 6 hold the copyright for that content, and access to the material should be sought from the respective journals. The remaining non-published content of the thesis may be made available for loan, limited copying and communication in accordance with the *Copyright Act* (1968).

Date: 10/11/2015

Cécile L'Hermitte

STATEMENT OF CO-AUTHORSHIP

The manuscripts contained in this thesis comply with the University of Tasmania's *Authorship of Research Policy*. The following people and institutions contributed to the publication of work undertaken as part of the thesis:

Cécile L'Hermitte, *Australian Maritime College, University of Tasmania*

= Candidate/Author 1

Marcus Bowles, *Australian Maritime College, University of Tasmania*

= Author 2

Peter Tatham, *Department of International Business and Asian Studies, Griffith University*

= Author 3

Benjamin Brooks, *Australian Maritime College, University of Tasmania*

= Author 4

Author details and their roles:

Paper 1 (located in Section 6.1)

L'Hermitte, C., Bowles, M. and Tatham, P.H. (2013), "A new classification model of disasters based on their logistics implications", in Lane, R. and Kahn, D. (Eds.), *11th ANZAM Operations, Supply Chain and Services Management Symposium, Brisbane, Australia, 20-21 June*.

The Candidate is the main author and was primarily responsible for the conception, planning and execution of the work. Authors 2 and 3 contributed to the idea as well as its formalisation and refinement. The Candidate's contribution is approximately 80%.

Paper 2 (located in Section 6.2)

L'Hermitte, C., Tatham, P.H. and Bowles, M. (2014), "Classifying logistics-relevant disasters: conceptual model and empirical illustration", *Journal of Humanitarian Logistics and Supply Chain Management*, Vol. 4, No. 2, pp. 155-78.

The Candidate is the main author and was primarily responsible for the conception, planning and execution of the work, including the qualitative data analysis. Authors 2 and 3 contributed to the idea as well as its formalisation and refinement. The Candidate's contribution is approximately 80%.

Paper 3 (located in Section 6.3)

L'Hermitte, C., Bowles, M., Tatham, P.H. and Brooks, B. (2015), "An integrated approach to agility in humanitarian logistics", *Journal of Humanitarian Logistics and Supply Chain Management*, Vol. 5, No. 2, pp. 209-33.

The Candidate is the main author and was primarily responsible for the conception, planning and execution of the work. Authors 2, 3 and 4 contributed to the idea as well as its formalisation and refinement. The Candidate's contribution is approximately 80%.

Paper 4 (located in Section 6.4)

L'Hermitte, C., Tatham, P.H., Bowles, M. and Brooks, B. (2016), "Developing organisational capabilities to support agility in humanitarian logistics: an exploratory study", *Journal of Humanitarian Logistics and Supply Chain Management*, Vol. 6, No. 1, pp. 72-99.

The Candidate is the main author and was primarily responsible for the conception, planning and execution of the work, including the qualitative data analysis. Authors 2 and 3 reviewed this analysis and, with Author 4, contributed to the idea as well as its formalisation and refinement. The Candidate's contribution is approximately 90%.

Paper 5 (located in Section 6.5)

L'Hermitte, C., Brooks, B., Bowles, M. and Tatham, P.H. (2016), "Investigating the strategic antecedents of agility in humanitarian logistics", *Disasters*, Accepted for publication.

The Candidate is the main author and was primarily responsible for the conception, planning and execution of the work, including the quantitative data analysis. Author 4 reviewed this analysis and, with Authors 2 and 3, contributed to the idea as well as its formalisation and refinement. The Candidate's contribution is approximately 90%.

Paper 6 (located in Section 6.6)

L'Hermitte, C., Tatham, P.H., Brooks, B. and Bowles, M. (201x), "Supply chain agility in humanitarian protracted operations", *Journal of Humanitarian Logistics and Supply Chain Management*, Vol. 6, No. 2, Accepted for publication.

The Candidate is the main author and was primarily responsible for the conception, planning and execution of the work, including the qualitative and quantitative data analyses. Authors 2, 3 and 4 contributed to the idea as well as its formalisation and refinement. The Candidate's contribution is approximately 90%.

Statement of co-authorship

We, the undersigned, agree with the above-stated proportion of work undertaken for each of the published, accepted or submitted peer-reviewed manuscripts contributing to this thesis.

Candidate/Author 1: _____ Date: 20/10/2015
Cécile L'Hermitte

Author 2: _____ Date: 21/10/2015
Marcus Bowles

Author 3: _____ Date: 29/10/2015
Peter Tatham

Author 4: _____ Date: 20/10/2015
Benjamin Brooks

Director: _____ Date: 23/05/2016
Thanasis Karlis
National Centre for Ports and Shipping
Australian Maritime College
University of Tasmania

ACKNOWLEDGEMENTS

It is absolutely impossible to think of this PhD journey without the many people who generously shared with me their time and expertise, offered me support, encouragements, as well as inspiration. They all made this journey an extremely pleasant effort and rewarding experience.

Most of all, I am indebted to my supervisory team for trusting me and letting me work independently but, nevertheless, for being always available at short notice when I needed their advice and support. I sincerely thank Marcus Bowles for repeatedly encouraging me to start a PhD, for his vision, the clarity of his mind, and his ability to simply articulate in one sentence what I would struggle to express in hundreds of words. I also truly thank Peter Tatham for his kind and gentle guidance, his attention to detail, his unflagging good spirits, and for opening the right doors at the right time. Many thanks as well to Ben Brooks for being an advocate of rigorous research, for his tenacity to challenge my assumptions and, by doing so, for stimulating my mind and making me argue over and over again.

This research could not have been conducted without the support of a large number of people within the Australian Maritime College and the University of Tasmania. I am grateful to Ian Bollard, Doug Colbeck, Judy Crees-Morris, Martin Crees-Morris, Hossein (Behrooz) Enshaei, Tony Lohrey, Margareta Lutzhoft, Chris McGee, Hong-Oanh (Owen) Nguyen, Dorian Notman, Hilary Pateman, Dev Ranmuthugala, Halina Rybczyk, Quazi Sakalayan, Katherine Shaw, Brian Stanley, Lindsey Steers, Paula Swatman, Christine Veltman, David Waldron, Nicholas Walkem, and Jeong Jin Yu.

In addition to the university staff (or former university staff), many people have contributed significantly to this project. Special thanks to Katja Hildebrand, David Makepeace, Lerna Mendoza, Adrian van der Knaap, Mike Whiting, and all the interviewees and survey respondents who took part in this research.

Last but not least, a big thank you to Francis for his full support, for showing remarkable patience, for being proud of me, for taking care of our day-to-day life, and for making sure that I would get back home on time.

TABLE OF CONTENTS

ABSTRACT	i
DECLARATION OF ORIGINALITY	iii
STATEMENT OF ETHICAL CONDUCT	iii
STATEMENT REGARDING PUBLISHED WORK AND AUTHORITY OF ACCESS	iii
STATEMENT OF CO-AUTHORSHIP	iv
ACKNOWLEDGEMENTS.....	vii
TABLE OF CONTENTS	viii
LIST OF FIGURES.....	x
LIST OF TABLES	xi
LIST OF ABBREVIATIONS	xii
LIST AND STATUS OF PUBLICATIONS	xiii
1. INTRODUCTION	1
1.1. Research background.....	1
1.1.1. Humanitarian logistics.....	1
1.1.2. Humanitarian vs. business logistics and supply chain operations	3
1.1.3. The concept of agility	7
1.1.4. Humanitarian protracted operations.....	9
1.2. Research gaps	12
1.2.1. The nature of risk and uncertainty in humanitarian logistics	12
1.2.2. The strategic antecedents of agility in humanitarian logistics.....	13
1.2.3. The need for agility in humanitarian protracted operations	14
1.3. Research questions	16
1.3.1. Primary and subsidiary research questions	16
1.3.2. Linking research questions to the published work	18
1.4. Outline of the thesis.....	19
2. THEORETICAL FRAMEWORK.....	22
2.1. Systems theory.....	22
2.1.1. The components of a system	22
2.1.2. Making decisions in complex and dynamic environments	24
2.1.3. Contribution of systems theory to this research	26
2.2. The dynamic capabilities model.....	27
2.2.1. Presentation of the model	27
2.2.2. Contribution of the dynamic capabilities model to this research	28
2.3. Deductive and inductive approach	29
2.3.1. Beyond systems theory and the dynamic capabilities model	29
2.3.2. The theoretical approach of the publications.....	32

3. METHODS AND MATERIALS.....	34
3.1. Methodological framework.....	34
3.1.1. Mixed-method research.....	34
3.1.2. Case study research.....	37
3.2. Primary data collection	39
3.2.1. Collecting qualitative data through interviews	40
3.2.2. Collecting quantitative data through an online survey	41
3.2.3. Sampling limitations	44
3.3. Data analysis.....	47
3.3.1. Qualitative content analysis	47
3.3.2. Structural equation modelling.....	48
3.3.3. Descriptive statistics.....	50
4. PUBLISHED RESULTS	52
4.1. Presentation of the key results	53
4.1.1. Paper I.....	53
4.1.2. Paper II.....	54
4.1.3. Paper III.....	55
4.1.4. Paper IV	56
4.1.5. Paper V	56
4.1.6. Paper VI	57
4.2. Contributions of the research	58
4.2.1. Moving from an operational to a strategic focus	59
4.2.2. Identifying the strategic level agility capabilities	61
4.2.3. Developing a set of practices supporting the strategic level capabilities.....	61
4.2.4. Going beyond supply chain-related risks and uncertainties	62
4.2.5. Going beyond emergencies: the need for agility in protracted operations	63
5. DISCUSSIONS AND CONCLUSIONS.....	65
5.1. Implications of the research.....	65
5.1.1. Implications for research in humanitarian logistics.....	65
5.1.2. Theoretical implications	66
5.1.3. Implications for humanitarian organisations	68
5.2. Constraints and limitations of the research	70
5.3. Recommendations for future research	71
5.4. Final observations	74
6. APPENDED PAPERS.....	76
6.1. Paper I	78
6.2. Paper II	96
6.3. Paper III	118
6.4. Paper IV	140
6.5. Paper V	167
6.6. Paper VI	189
REFERENCES	217
APPENDICES.....	237
Appendix 1: WFP letter of invitation	238
Appendix 2: Interview questions	239
Appendix 3: Survey questionnaires	240
Appendix 4: Leadership decision making areas.....	265

LIST OF FIGURES

Figure 1.1: Flow of supplies down a typical humanitarian supply chain	2
Figure 1.2: Multi-level approach to agility	9
Figure 1.3: Disaster management cycle	10
Figure 1.4: Research themes	16
Figure 1.5: Research questions	17
Figure 1.6: Thesis outline	20
Figure 1.7: Progress tracker – Moving to Chapter 2	21
Figure 2.1: System levels	23
Figure 2.2: Theoretical approach	30
Figure 2.3: Progress tracker – Moving to Chapter 3	32
Figure 3.1: The emergence of the theory of agility in humanitarian logistics	37
Figure 3.2: SEM model	49
Figure 3.3: Progress tracker – Moving to Chapter 4	51
Figure 4.1: Filling the research gaps.....	59
Figure 4.2: Moving the focus of agility to a higher system level.....	60
Figure 4.3: Progress tracker – Moving to Chapter 5	64
Figure 5.1: Progress tracker – Moving to Chapter 6	75

LIST OF TABLES

List and status of publications.....	xiii
Table 1.1: Business and humanitarian supply chains.....	4
Table 1.2: Linking the papers to the research gaps and the research questions	19
Table 2.1: Theories associated with the publications.....	33
Table 3.1: Methodological framework.....	35
Table 3.2: Research methods recap.....	51
Table 4.1: Key results and conclusions	52
Table 6.1: Publication recap.....	76

LIST OF ABBREVIATIONS

The following abbreviations are used in this thesis:

α	Cronbach's Alpha
χ^2	Chi-Square
ACMC	Australian Civil-Military Centre
ADB	Asian Development Bank
AMOS	Analysis of Moment Structures
CFI	Comparative Fit Index
CILT UK	Chartered Institute of Logistics and Transport in the United Kingdom
CRED	Centre for Research on the Epidemiology of Disasters
CRS	Congressional Research Service
CSCMP	Council of Supply Chain Management Professionals
DCM	Dynamic Capabilities Model
DF	Degree of Freedom
FEWS NET	Famine Early Warning Systems Network
FSNAU	Food Security and Nutrition Analysis Unit
FW	Field Worker
GDP	Gross Domestic Product
GFI	Goodness-of-Fit Index
HAP	Humanitarian Accountability Partnership
HELP	Humanitarian Emergency Logistics Professionals
IDP	Internally Displaced Person
IRIN	Integrated Regional Information Networks
IT	Information Technology
MA	Managerial Staff
MCAR	Missing Completely At Random
MSF	Médecins Sans Frontières
NGO	Non-Governmental Organisation
OCFA	Office for the Coordination of Foreign Aid
OCHA	Office for the Coordination of Humanitarian Affairs
PAHO	Pan American Health Organization
PRRO	Protracted Relief and Recovery Operation
RBV	Resource-Based View
RMSEA	Root Mean Square Error of Approximation
RQ	Research Question
SD	Standard Deviation
SE	Standard Error
SEM	Structural Equation Modelling
SP	Support Staff
SPSS	Statistical Package for the Social Sciences
SRMR	Standardised Root Mean Square Residual
UN	United Nations
UNHCR	United Nations High Commissioner for Refugees
UNISDR	United Nations International Strategy for Disaster Reduction
USAID	United States Agency for International Development
WFP	World Food Programme

LIST AND STATUS OF PUBLICATIONS

This research includes six papers that are published or accepted for publication. These papers have been reproduced in Chapter 6.

Paper	Nature	Status	Title	Publication channel	Publication details	Full-length, double-blind review
I	Conceptual paper	Published (2013)	A new classification model of disasters based on their logistics implications	11th ANZAM Operations, Supply Chain and Services Management Symposium, Brisbane, Australia	ISBN number: 978-0-646-90576-1 Editors: Lane, R. and Kahn, D.	Yes
II	Conceptual/ Research paper	Published (2014)	Classifying logistics-relevant disasters: conceptual model and empirical illustration	<i>Journal of Humanitarian Logistics and Supply Chain Management</i>	Vol. 4, No. 2, pp. 155-78	Yes
III	Conceptual paper	Published (2015)	An integrated approach to agility in humanitarian logistics	<i>Journal of Humanitarian Logistics and Supply Chain Management</i>	Vol. 5, No. 2, pp. 209-33	Yes
IV	Research paper	Published (2016)	Developing organisational capabilities to support agility in humanitarian logistics: an exploratory study	<i>Journal of Humanitarian Logistics and Supply Chain Management</i>	Vol. 6, No. 1, pp. 72-99	Yes
V	Research paper	Accepted for publication	Investigating the strategic antecedents of agility in humanitarian logistics	<i>Disasters</i>	Before it appears in a printed and digital issue of the journal, the paper will be published online in Wiley's Early View facility	Yes
VI	Research paper	Accepted for publication (2016)	Supply chain agility in humanitarian protracted operations	<i>Journal of Humanitarian Logistics and Supply Chain Management</i>	Vol. 6, No. 2	Yes

1. INTRODUCTION

Chapter 1 introduces the general topic and main concepts of this research. It also aims to provide definitions of the key terms, to identify the research gaps, and to formulate a set of research questions designed to guide the whole doctoral project.

1.1. Research background

1.1.1. Humanitarian logistics

2014 presented unique challenges for the humanitarian community. Over 107 million people (about 11 million more than in 2013) were affected by natural disasters. In addition, 58 million people had to flee violence and persecution, which constituted the highest number of displaced people ever recorded. That same year, five crises were designated Level 3 by the United Nations (UN). On the UN scale, Level 3 is the highest level of emergency and concerns acute and extensive crises requiring an exceptional level of response and resources. The five crises designated Level 3 in 2014 were Central African Republic, Syria, South Sudan, Iraq and the Ebola outbreak (Development Initiatives, 2015).

In this context, the role of humanitarian organisations is ‘to relieve human suffering, especially in circumstances where responsible authorities in the area are unable or unwilling to provide adequate service support to civilian populations’ (Relief Web, 2008, p. 30). In particular, humanitarian operations are conducted in order to assist the affected people in securing the basic human necessities (including nutrition, sanitation and shelter) and/or in re-establishing their livelihoods (Development Initiatives, 2015).

Logistics is essential to the performance and success of relief operations as it enables the right humanitarian items to be delivered to the right place, at the right time, in the right quantities, in the right condition, and at the right cost (Van Wassenhove, 2006; Abidi *et al.*, 2013; Fenton *et al.*, 2014). Thus, in a similar way to business logistics, humanitarian logistics is the process of managing the movement and storage of goods, and the humanitarian supplies progress down the supply chain through a number of stages from the point of availability to the point of final distribution, as illustrated in Figure 1.1.

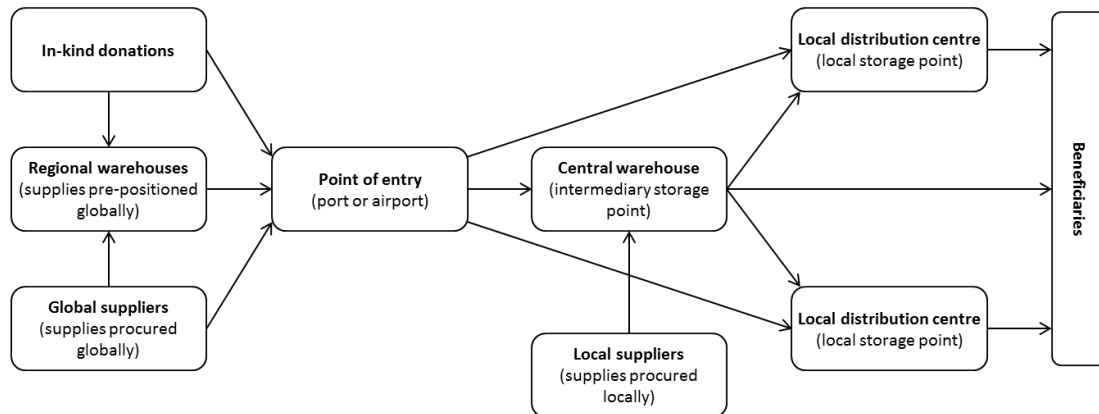


Figure 1.1: Flow of supplies down a typical humanitarian supply chain (adapted from Beamon and Balcik, 2008; Balcik *et al.*, 2010)

Within the literature, humanitarian logistics has been repeatedly defined as:

The process of planning, implementing and controlling the efficient, cost-effective flow and storage of goods and materials as well as related information, from the point of origin to the point of consumption for the purpose of meeting the end beneficiary's requirements (Thomas and Mizushima, 2005, p. 60).

This definition reflects that of business logistics management as formulated by the Council of Supply Chain Management Professionals (CSCMP) which states that:

Logistics management is that part of supply chain management that plans, implements, and controls the efficient, effective forward and reverses flow and storage of goods, services and related information between the point of origin and the point of consumption in order to meet customers' requirements (CSCMP, 2015).

The strong parallels in the wording and intent of these two definitions reinforce the view of a number of authors (e.g. Taylor and Pettit, 2009; Everywhere *et al.*, 2011) who argue that business principles are applicable to the humanitarian context, as will be the case in this research.

Business logistics and supply chain management are two concepts with unclear conceptual boundaries and commonly used differently not only by researchers, but also by practitioners (Larson and Halldórsson, 2004; Larson *et al.*, 2007). In the humanitarian context, the concepts have not been clearly delineated either and humanitarian logistics and supply chain management are frequently used interchangeably (Overstreet *et al.*, 2011). Mostly, this is because, in the practice, humanitarian logistics relates to more than the nuts and bolts of transporting, storing, and distributing relief items and covers higher level considerations such as the selection of suppliers and/or

logistics service providers, coordination and collaboration with supply chain partners, as well as the integration of the supply network (Tatham and Pettit, 2010).

Larson and Halldórsson (2004) identify four perspectives on logistics vs. supply chain management. These are the traditionalist perspective (that considers supply chain management as a sub-set of logistics), the re-labelling perspective (that uses both concepts interchangeably), the unionist perspective (that sees logistics as a sub-set of supply chain management), and the inter-sectionist perspective (that takes a functional view of logistics and a strategic view of supply chain management). In particular, the inter-sectionist perspective considers supply chain management as an integrative activity that cuts across business functions such as logistics, operations management, and information technology in order to coordinate efforts across multiple supply chain participants. In a later study using a survey of supply chain management professionals, Larson *et al.* (2007) provide evidence that practitioners tend to prefer broad and multi-functional perspectives of supply chain management.

This research embraces the above-mentioned inter-sectionist perspective and considers, along with a number of researchers in the humanitarian discipline (e.g. Day *et al.*, 2012), that logistics has an operational and tactical orientation, whereas the scope of humanitarian supply chain management is broader and strategic in nature. In other words, this research considers that there is no hierarchical relationship between logistics and supply chain management and that both concepts focus on different aspects of the flow of goods.

1.1.2. Humanitarian vs. business logistics and supply chain operations

Despite the apparent similarities between humanitarian and business logistics, humanitarian operations display distinctive and different characteristics, especially in emergency situations. These characteristics, summarised in Table 1.1, need to be taken into consideration when applying business principles to the humanitarian context.

Most importantly, whilst the aim of business supply chains is to increase profit, the purpose of humanitarian supply chains is to save lives and/or to reduce the suffering of those affected (Tomasini and Van Wassenhove, 2009). Another distinguishing element relates to the concept of customer. Business supply chains typically serve paying customers who voluntarily consume products and, by doing so, provide revenue to the business organisation. In contrast, humanitarian organisations are voluntarily funded by donors and provide services (i.e. assistance) to beneficiaries who do not pay for these services (Beamon and Balcik, 2008; McLachlin *et al.*, 2009).

	Business supply chains	Humanitarian supply chains
Purpose	Increasing profit	Saving lives and/or reducing suffering
Customers	Paying customers provide revenue to the organisation	Non-paying beneficiaries receive aid financed by donors' voluntary contributions
Demand patterns	Relatively stable and predictable	Extremely unpredictable
Delivery lead times	Established and agreed with customers	Extremely short and difficult to forecast
Supply chain participants	Established partners	Heterogeneous and with multiple and frequently changing partners
Information technology	Use of advanced and integrated technology	No systematic and effective use of supporting technology
Real time information	Timely and accurate information available	Lack of timely and accurate information
Order fulfilment processes	Relatively static and integrated	Changing and adapted to each specific disaster situation

Table 1.1: Business and humanitarian supply chains (adapted from Beamon and Balcik, 2008)

Demand patterns are also different in business and humanitarian supply chains. In the commercial environment, demand patterns are often relatively stable and predictable since, usually, customers place regular orders that can be forecasted with some degree of certainty. Unlike business supply chains, demand patterns are extremely unpredictable in an emergency environment and humanitarians are unable to forecast future needs as a result of the uncertainty regarding the place, time and scale of a disaster (Beamon and Balcik, 2008). As a consequence, business and humanitarian organisations face different scenarios in terms of delivery lead times. In business supply chains, lead times are established, agreed with customers, and vary from days to months depending on the nature of the goods ordered and on their points of origin and destination. In contrast, in emergency supply chains, extremely short lead times are available between a disaster alert and the urgent need for humanitarian supplies (Beamon and Balcik, 2008). Thus, emergency operations are characterised by the absence of operational control and the need to adapt rapidly to unpredictable circumstances.

In addition, whilst the participants in business supply chain activities are typically established through contracts and usually form a well-defined network, a broad range of actors (i.e. organisations participating actively in the deliveries of relief items) are involved in humanitarian operations (Van Wassenhove, 2006; Beamon and Balcik, 2008). Their identity may not even be known in advance, and their involvement is contingent on the factors discussed above and on the specific circumstances of a

disaster environment. Thus, in addition to humanitarian organisations, i.e. Non-Governmental Organisations (NGOs), the Red Cross and Red Crescent network, and UN agencies, the humanitarian supply networks include governmental authorities, logistics service providers, suppliers, and the military (Kovács and Spens, 2008; Balcik *et al.*, 2010). Heaslip *et al.* (2012) argue that, apart from these actors, a number of stakeholders (i.e. organisations or groups influencing the development of the humanitarian activities) are involved in the disaster relief process. Stakeholders include, for example, donors and the media, although disagreements can be found in the humanitarian logistics literature in this regard (Heaslip *et al.*, 2007; Kovács and Spens, 2008). Whilst, arguably, donors can act as suppliers and may, in these circumstances, be considered as actors rather than stakeholders, the media do not participate actively in the deliveries of relief items and should, therefore, be considered as a stakeholder (Kovács and Spens, 2008). That said, this discussion is not crucial in regard to the nature and focus of the current research and is, therefore, not further developed.

More importantly, since it is extremely rare for a humanitarian organisation to be in sole charge of an end-to-end delivery, i.e. from the point of availability of the supplies (either suppliers'/donors' delivery points or warehouses where supplies are pre-positioned) to the beneficiaries, intermediaries need to be involved. For example, local governmental partners or other humanitarian organisations frequently undertake some elements of the operation, especially in the last-mile delivery of humanitarian supplies (Thomas and Kopczak, 2005; Schulz, 2008; Logistics Cluster, 2013a).

One further element distinguishing business from humanitarian supply chains is the availability and use of information technology (IT) to manage the flow of information within and across organisations. Commercial organisations, typically, take advantage of advanced and integrated IT in order to manage their supply chain operations. Initiatives to develop IT solutions in the humanitarian environment also exist and some organisations have been able to benefit from these. However, the supporting technology in the humanitarian environment is, to a great extent, lacking in sophistication, mainly as a result of funding constraints (Beamon and Balcik, 2008; Whiting and Ayala-Öström, 2009; Scholten *et al.*, 2010). In any event, the impact of a disaster may severely degrade the communication systems, thereby further limiting the ability of humanitarian organisations to use them (Kovács and Spens, 2009).

Yet, timely and accurate information is essential to create visibility, increase flexibility in delivery and, ultimately, to move from a push (forecast-driven) to a pull (demand-driven) delivery system (Christopher, 2011). This is not only true in business supply chains, but also in humanitarian operations. In particular, real-time information relating to demand, inventory levels, the physical location of the goods (stored and in transit), and the estimated arrival time of shipments is essential to increase the effectiveness

and efficiency of relief operations (Beamon and Balcik, 2008). However, despite recent progress, advanced track and trace tools typically remain unused (or at least underutilised) in the humanitarian sector. Especially, small and medium-sized humanitarian organisations still rely on manual records and spreadsheets to track and trace the movements of goods, and this results in the limited availability of timely and accurate information in humanitarian operations (Blansjaar and Stephens, 2014).

Finally, differences exist between business and humanitarian supply chains in respect of the order fulfilment processes such as those related to warehousing, transport, or demand management. In the business environment, these processes are well established, relatively static and integrated. However, the multiple unknowns in humanitarian operations make planning extremely complicated and processes often need to be adjusted to meet the local circumstances of each disaster situation. For example, humanitarian delivery processes must be adapted to situational factors such as the level of road accessibility, the level of reliability of the local service providers, and/or the level of availability of transport and storage capacity (Beamon and Balcik, 2008; Holguín-Veras *et al.*, 2012).

Whilst the above-mentioned supply chain characteristics are repeatedly discussed in the literature, they need to be qualified because they do not necessarily apply to all supply chain operations, neither in the business, nor in the humanitarian context. For example, Christopher and Holweg (2011) argue that turbulence also exists in the business environment and, as a result, that business supply chain operations may become uncertain and volatile. Similarly, Christopher *et al.* (2006) contend that demand is not always predictable and lead times are not always well established in commercial supply chains.

The characteristics presented in Table 1.1 should also be qualified in relation to humanitarian operations. As noted by a number of authors (e.g. Kovács and Spens, 2007, 2008; Holguín-Veras *et al.*, 2012), the concept of humanitarian logistics refers to a great diversity of operations, not least as a result of the various nature of disasters and the different levels of emergency (L'Hermitte *et al.*, 2013; L'Hermitte *et al.*, 2014). In other words, as will be further explained in Section 1.1.4, humanitarian operations are not limited to emergency responses, and humanitarian organisations frequently operate in somewhat less turbulent environments.

That being said, this section highlights the complexity of humanitarian environments and the broad range of challenges that humanitarian organisations face. It also makes it clear that humanitarian organisations need to be responsive and flexible in order to deal with these constraints and disruptions and, ultimately, to deliver the humanitarian supplies when and where they are needed.

1.1.3. The concept of agility

Notwithstanding the diversity in humanitarian operations, they all share one common characteristic, that is, the ongoing presence of risk and uncertainty in the field. Mostly, this is because humanitarian organisations typically operate in developing countries and in complex environments (Long and Wood, 1995; Van Wassenhove, 2006). As an example, in the aftermath of the 7.8-magnitude earthquake that struck Nepal in April 2015, logistics constraints and challenges included the widespread destruction of the communication and transport infrastructure as well as bottlenecks due to the insufficient airport capacity in Kathmandu, the main point of entry into Nepal. The needs assessments (e.g. types of goods needed, volumes, as well as delivery locations) and the deliveries were also impeded by the difficulty in accessing remote mountain villages and the risk of landslides due to the start of the monsoon season (Logistics Cluster, 2015b).

As a consequence of the ongoing uncertainty and complexity associated with humanitarian logistics and supply chain operations, Oloruntoba and Gray (2006) as well as Charles *et al.* (2010) argue that humanitarian organisations need to develop agile capabilities. In other words, they need to be able to respond swiftly and effectively to changing circumstances and adapt their practices to the requirements of the operational environment.

Originally developed in the manufacturing sector in the 1990s (e.g. Goldman and Nagel, 1993; Kidd, 1994; Gunasekaran, 1999; Yusuf *et al.*, 1999), agility has been subsequently studied in the areas of strategic management (e.g. Weick and Sutcliffe, 2001; Doz and Kosonen, 2008a; O'Reilly and Tushman, 2008; McCann and Selsky, 2012), supply chain management (Christopher, 2000; Power *et al.*, 2001; Lee, 2004; Gattorna, 2006; Gligor, 2013), and project management (e.g. Appelo, 2011; Cobb, 2011). Whilst the concept of agility appears widely in the literature, its meaning varies in different contexts (Sanchez and Nagi, 2001; Gunasekaran and Yusuf, 2002) and authors frequently delineate it in different ways (Hofman and Cecere, 2005; Gligor, 2013). Indeed, as reviewed by Gligor and Holcomb (2012b) and by Gligor (2013), multiple definitions of agility are used both in the broader management literature as well as that related to supply chains. In part, this is because academics from various disciplines have studied agility at different levels of the organisation, i.e. at the very broad strategic level that prepares the organisation for the future, at the extremely narrow operational level to improve operations and processes (Li *et al.*, 2008), and at multiple levels concurrently (Dekker, 2006; McCann and Selsky, 2012). For example, Christopher and Towill (2001, p. 236) take the extended view that supply chain 'agility is a business-wide capability that embraces organisational structures, information systems, logistics processes and, in particular, mindsets',

whereas Lee (2004, p. 105) adopts a much narrower definition, i.e. the ability to 'respond to short-term changes in demand or supply quickly'.

In the humanitarian logistics literature, agility is mostly perceived as a capacity-driven strategy enabled by the building of redundancy at the operational level, the ability to rapidly adapt operations, and/or the rapid mobilisation of operational resources (Charles *et al.*, 2010; Cozzolino *et al.*, 2012). This includes, for example, stockpiling inventory, establishing stand-by teams that can be deployed within hours anywhere in the world, and/or changing the delivery arrangements. This operational approach to agility reflects the traditional view found in the business logistics and supply chain literature where, according to Wieland and Wallenburg (2012), agility is frequently perceived as a reactive ability based on speed and operational adaptation.

This research takes a different perspective and, by drawing on the broader management literature (as will be further explained in Section 1.2.2), it argues that limiting supply chain agility to operational matters is suboptimal and that a system-wide (i.e. organisational) approach is needed. Such an approach supports not only reactive, but also proactive and continuous adaptation to changing circumstances. In other words, operational agility is optimised when the system (the organisation) possesses certain capabilities that underpin responsive and flexible logistics operations. Therefore, in this research, agility is defined as follows:

Agility is the adaptive capacity of an organisation as a whole to build strategic capabilities that support operational responsiveness and flexibility in order to manage existing or arising risks, uncertainties, and opportunities in the logistics and supply chain environment (L'Hermitte et al., 2015, p. 211).

This definition goes beyond operational capacity building and embraces organisational capacity building, as emphasised by the first words of the definition. Thus, in this research, supply chain agility is not only about adapting to emerging changes, but also about supporting and facilitating the necessary adjustments. Such support is provided by the leaders and managers of humanitarian organisations, and includes various areas such as recruitment, decision making, having a clear organisational purpose, facilitating the availability of resources, maintaining collaborative relationships, and continuously improving practices (James, 2008).

By arguing that supply chain agility not only refers to responsive and flexible operations, but also arises from leadership and management inputs, this research takes a multi-level approach to the concept. Thus, as illustrated in Figure 1.2, it is argued that field responsiveness and flexibility result from organisational capacity developed at the strategic level of the organisation.

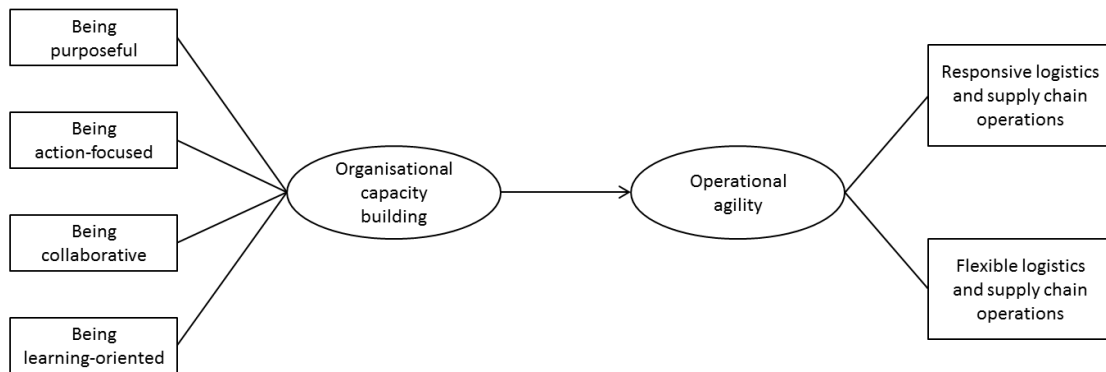


Figure 1.2: Multi-level approach to agility

The above figure shows that organisational capacity building is reflected in four strategic level capabilities that have been identified in the course of the research process. These four higher order capabilities are:

- Being purposeful (the capacity to maintain a clear direction for humanitarian action),
- Being action-focused (the capacity to build readiness and marshal the organisation to respond to the risks, uncertainties and opportunities encountered along the humanitarian supply chains and across multiple operations),
- Being collaborative (the capacity to build and sustain relationships within and outside the humanitarian organisation in order to solve problems collaboratively),
- Being learning-oriented (the capacity to identify and capture past field experiences, to share them across operations, and to turn them into improved practices).

At the operational level, responsiveness is defined as the ability to rapidly sense and identify operational risks and opportunities along the supply chain, as well as to swiftly draw up a suitable response. Flexibility is defined as the ability to act in a timely manner and to swiftly adjust logistics operations.

1.1.4. Humanitarian protracted operations

Despite having gained attention and having substantially expanded since the 2004 Indian Ocean tsunami (Kovács and Spens, 2011b), humanitarian logistics remains a body of knowledge at its early stage of development (Tatham *et al.*, 2009). This is evidenced by the existence of just one dedicated academic journal, the *Journal of*

Humanitarian Logistics and Supply Chain Management, which was itself first published in 2011 (Kovács and Spens, 2011a). A number of literature reviews of humanitarian logistics research, the most recent of which is reported in Leiras *et al.* (2014), also confirm that research in this discipline remains limited. In particular, Leiras *et al.* (2014) indicate that just 228 papers were published in the period 1982-2012, 135 of which (60%) were published after 2004 (the year of the Indian Ocean tsunami) and 41 (18%) in 2011 only (the year of the first publication of the *Journal of Humanitarian Logistics and Supply Chain Management*). Thus, humanitarian logistics is still an emerging field of research whose core concepts need to be clarified (Tatham *et al.*, 2013).

Among those, the concept of protracted operations, i.e. longer-term and regular humanitarian operations, has, to date, not been precisely studied and delineated because the existing humanitarian logistics literature focuses primarily on emergency disaster relief (Kunz and Reiner, 2012). Given that protracted operations is an important part of this research project, the aim of this section is to present and define the concept.

Humanitarian assistance is rarely limited to the immediate response to a disaster (Development Initiatives, 2015). As illustrated in Figure 1.3, disaster management is an ongoing process that supports the planning for and the response to a disaster, as well as the reduction of its impacts throughout four phases (disaster occurrence, emergency response, recovery, and prevention).

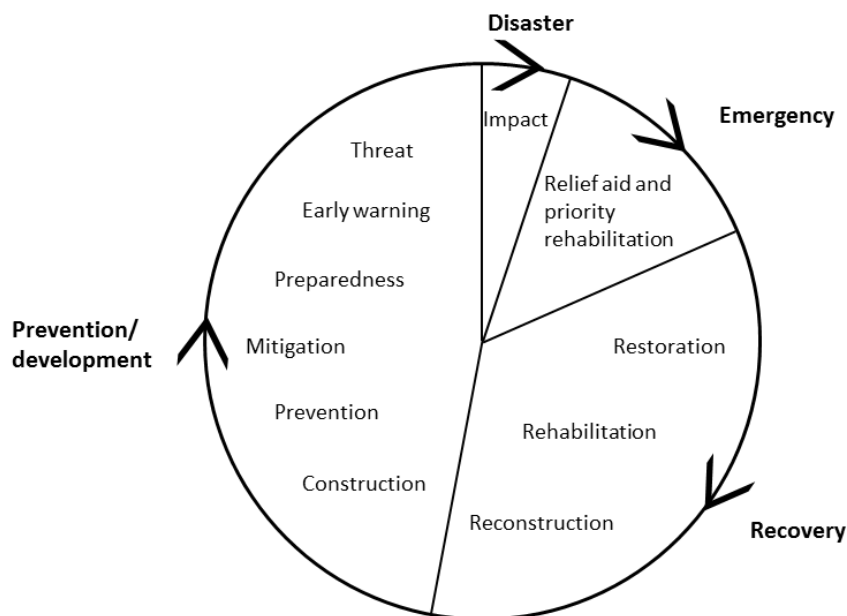


Figure 1.3: Disaster management cycle (adapted from ADB, 2004)

After the disaster occurrence and the initial estimation of its impact, the emergency response phase reflects the need to provide, as rapidly as possible, appropriate humanitarian relief to the affected populations. This is followed by a longer-term recovery phase in which governmental and humanitarian organisations focus on supporting reconstruction and on returning life to normality. Prevention and development programmes can be conducted before and/or after a disaster occurs. Before a disaster, prevention includes, among other things, the use of early warning information and/or mitigation initiatives (such as training practices or evacuation measures) in order to reduce the impact of unavoidable disasters. After a disaster, the prevention/development phase includes actions designed to reduce vulnerability (e.g. the development of new construction norms) in order to minimise the impact of future disasters (Kovács and Spens, 2008; Tomasini and Van Wassenhove, 2009; Tatham and Houghton, 2011).

Humanitarian organisations intervene in all phases of the disaster management cycle presented in Figure 1.3. However, such organisations do not define their operations along a continuum and typically differentiate between emergency operations and long-term development programmes. Some humanitarian organisations have bridged the gap between emergencies and long-term development by creating a third category of operations called protracted operations.

Humanitarian protracted operations are mainly conducted in the recovery phase of a disaster. In the event that slow-onset disasters such as famines are detected early enough to enable humanitarians to anticipate their response, protracted operations can also be conducted in the prevention phase of a disaster in order to mitigate the disaster impact. However, a number of authors (e.g. Lautze *et al.*, 2012) have pointed out that early warning and disaster detection do not always trigger timely humanitarian interventions, at least not to the extent required.

That said, in this research, humanitarian protracted operations are defined as longer-term operations in response to disaster situations that are anticipated and/or planned for. Protracted operations can be differentiated from emergencies through the time available for preparation and for action. Whilst emergencies are characterised by a high level of unpredictability and the need for immediate action, protracted operations are characterised by longer response times and more established and regular delivery patterns that allow for more repetitive supply chain operations. Despite this relative level of continuity, it is argued that the operational environment of protracted operations is not free of constraints, uncertainties and disruptions because humanitarian organisations typically operate in countries where a degree of instability, turbulence and operational complexity almost always prevails.

Focusing on protracted operations is important not least because these operations require a significant level of commitment and resources. In 2014, more than 90% of the humanitarian appeals were for countries that had received assistance for at least three years, and 60% for countries that had received aid resources for over eight years (Bennett, 2015). In addition, in the context of increasingly complex humanitarian crises that are spread over longer periods of time (Armstrong, 2014; Carpenter and Bennett, 2015), as illustrated by the civil war in Syria (USAID, 2015), an increased number of protracted operations can be expected in the future.

1.2. Research gaps

After having introduced the main concepts of this research in Section 1.1, this second section identifies the three research gaps that will guide the research presented in this thesis.

1.2.1. The nature of risk and uncertainty in humanitarian logistics

The first research gap relates to the identification and classification of risk and uncertainty in humanitarian logistics. In the broader supply chain literature, the nature of the challenges impacting on the flow of goods has been widely studied. For example, according to Christopher and Peck (2004), risks and uncertainties in supply chain operations may be (1) internal to the organisation (e.g. in relation to processes and procedures), (2) external to the organisation, but internal to the supply network (e.g. in relation to the upstream and downstream supply chain activities), and/or (3) external to the supply network, i.e. macro-environmental. Macro-environmental risks and uncertainties include a number of contextual and uncontrollable factors that impact on the performance of supply chain operations, as exemplified by the occurrence of heavy rainfalls which make roads impassable (Kunz and Reiner, 2012).

The humanitarian logistics literature (e.g. Van Wassenhove, 2006; Tatham and Houghton, 2011) repeatedly highlights the complexity and uncertainty inherent in humanitarian operations, including the unpredictability of some disaster events, the prevailing insecurity, the inadequacy of the local infrastructure, the lack of logistics capacity, and the need to work with a large number of heterogeneous partners. However, since the humanitarian logistics literature on agility primarily draws on the research conducted in the business context and, in particular, in the manufacturing sector, agility is still mostly studied as the ability to respond swiftly to challenges

internal to the organisation and/or the supply network, i.e. in relation to demand, supply and processes (Oloruntoba and Gray, 2006; Charles *et al.*, 2010). In contrast, disruptive external factors are rarely included in the research on agility in humanitarian logistics.

Thus, there continues to be a need to study humanitarian supply chain risk management in greater detail (Larson, 2011) and to clearly identify and classify the nature of the risks and uncertainties encountered in the field. This research will do so in order to gain a better understanding of the humanitarian operational environment and to identify the reasons why agility is needed in humanitarian logistics.

1.2.2. The strategic antecedents of agility in humanitarian logistics

The second research gap relates to the strategic antecedents of agility in humanitarian logistics. As previously mentioned, the concept of agility has been studied in disciplines as varied as manufacturing, strategic management, software development, and supply chain management. According to the authors cited in Section 1.1.3, succeeding in highly dynamic environments by conducting agile operations transcends the technical and operational level of an organisation and requires a strategic approach, i.e. the support of the highest level of an organisation. Thus, agility is directly related to the building of organisational capacity and the development of a number of higher capabilities that enable an organisation to be sensitive to the changes occurring in its environment, to make fast decisions to meet the requirements of this environment, and to swiftly reconfigure and redeploy internal resources in order to support these decisions (Doz and Kosonen, 2008a; Teece, 2009). These capabilities should be embedded in the way an organisation operates, i.e. in the organisation's structure and in its operational processes and routines (Teece and Pisano, 1994; Teece *et al.*, 1997).

A systems perspective incorporating both strategic and operational aspects of the concept of agility has, to date, not been given much attention in the humanitarian logistics literature. Clearly, authors in this discipline discuss a number of strategic issues such as the significance of training and human resource management (Kovács *et al.*, 2012), the development and improvement of knowledge management systems (Tomasini and Van Wassenhove, 2009; Tatham and Spens, 2011), partnerships with commercial organisations (Tomasini and Van Wassenhove, 2009), the importance of information management (Tomasini and Van Wassenhove, 2009; Blansjaar and Van der Merwe, 2011), and the collaboration with the military (Pettit and Beresford, 2009; Heaslip, 2012; Tatham and Rietjens, 2016). Similarly, Altay *et al.* (2009) identify a variety of strategic planning activities that support relief logistics operations. These include developing coordination plans, improving communication, setting up cross-

functional teams, choosing and establishing relationships with suppliers, and building storage capacity close to potential disaster areas. However, in the above-mentioned studies, the strategic issues considered are not specifically associated with agility. Only one (just published) empirical study that establishes a connection between organisational mechanisms and field responsiveness has been identified. In this study, Jahre and Fabbe-Costes (2015) investigate how the use and the combination of both operational and organisational standardisation and modularity have the potential to help humanitarian organisations increase their responsiveness to sudden-onset disasters and to rapid changes in the operating environment.

Thus, although the humanitarian logistics literature repeatedly highlights the need for humanitarian organisations to conduct agile operations (e.g. Oloruntoba and Gray, 2006; Charles *et al.*, 2010), the study of agility remains primarily at the operational level. For example, agility is associated with the ability of humanitarian organisations to adjust the range of supplies to the actual beneficiaries' needs by applying the principle of postponement (Oloruntoba and Gray, 2006), to swiftly assess the needs of those affected by a disaster, to promptly adapt deliveries such as the volume/range of relief items and/or the delivery dates (Charles *et al.*, 2010), to preposition supplies, and to rapidly mobilise operational resources (Cozzolino *et al.*, 2012). This operational approach to supply chain agility reflects the dominant perspective within humanitarian organisations which position logistics as an operational function rather than one serving the strategic objectives of the organisation (Whiting and Ayala-Öström, 2009).

The above discussions show that there is still a lack of academic research regarding the strategic determinants of agility in the humanitarian logistics context and the development of an organisational approach to agility. In particular, the strategic dimensions of supply chain agility as well as the nature of the leadership and management factors supporting agility remain to be investigated. This is a gap that the current research aims to address.

1.2.3. The need for agility in humanitarian protracted operations

The limited knowledge of the logistics environment of humanitarian protracted operations constitutes the third research gap identified in this research. In particular, the current humanitarian logistics literature primarily associates agility with emergency operations (Cozzolino *et al.*, 2012). As illustrated previously with the 2015 Nepal example, humanitarian organisations, undoubtedly, face an extremely high level of logistics and supply chain uncertainty in the aftermath of a sudden emergency disaster. This concerns, for example, the lack of knowledge about the number and location of

the people affected, the types of goods needed, and the condition of the logistics infrastructure.

The numerous unknowns prevailing at the very beginning of an emergency response do not exist to the same extent in the post-emergency phase of a disaster and, thus, in protracted operations. However, humanitarian organisations typically operate in unstable countries where contextual factors are frequently highly disruptive and negatively impact on logistics operations (Kunz and Reiner, 2012) during and beyond the emergency phase of a disaster. This suggests that agility is an important operational requirement at all times and in all operations, i.e. not only in emergency responses, but also in longer-term and more regular operations.

This view is, nevertheless, not reflected in the current humanitarian logistics literature that frequently perceives supply chain agility as a 'whatever it takes' approach needed in the immediate aftermath of a disaster and that, to a large extent, ignores costs (Gattorna, 2006). Since humanitarian organisations operate under financial constraints, Cozzolino *et al.* (2012) consider that a continuous high level of agility is not sustainable and, therefore, not applicable to protracted operations. This research, in contrast, does not perceive agility as a way of providing short-term assistance 'at any cost' as, clearly, sustaining this type of agility in protracted operations is not possible. Rather, as reflected in the definition provided in Section 1.1.3, agility is seen as the ability of an organisation as a whole to support and carry out swift and continuous adjustments in order to respond to the multiple risks and uncertainties encountered in most humanitarian environments.

It follows that there continues to be a need to explore the logistics environment of protracted operations in greater detail in order to establish if agility is an important requirement in such operations. This study aims to address this limitation.

In summary, this section identifies three research gaps that will guide the investigations undertaken in this thesis. Thus, with the above discussions in mind, the research focus will be on the following three topics: (1) the risks and uncertainties in humanitarian logistics, (2) the strategic antecedents of agility, and (3) humanitarian protracted operations. Figure 1.4 illustrates this research focus.

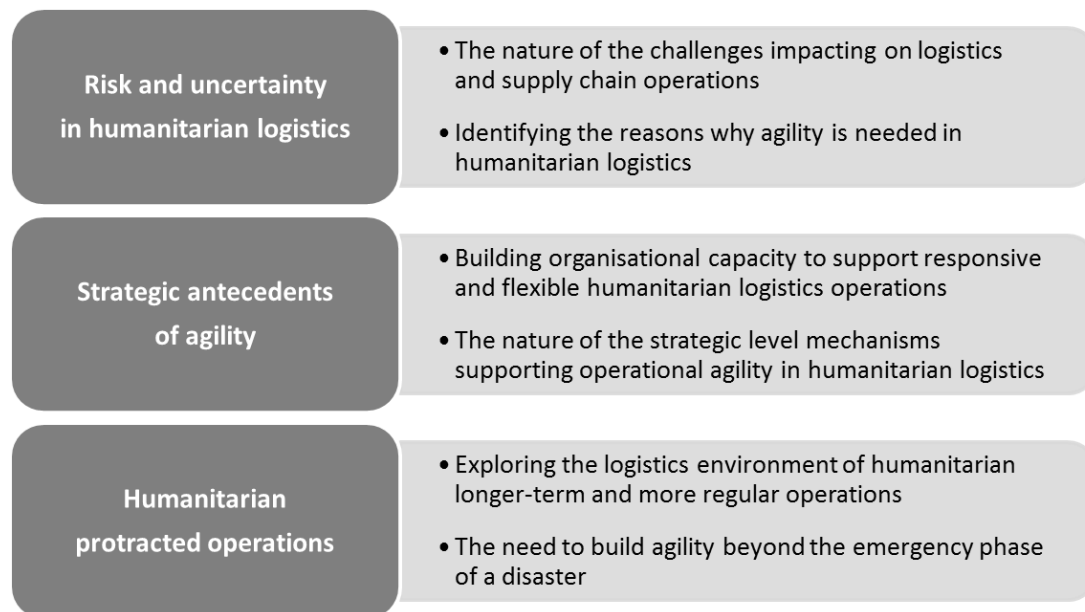


Figure 1.4: Research themes

1.3. Research questions

1.3.1. Primary and subsidiary research questions

This section formulates a set of research questions and explains how answering them will contribute to filling the gaps previously identified. Consistent with the above discussions, the main interest of this study is the underlying strategic mechanisms of agility in humanitarian logistics. Thus, the primary research question is as follows:

How can humanitarian organisations improve supply chain agility by building organisational capacity?

In order to answer this question and to guide our research, five subsidiary research questions have been developed (see Figure 1.5).



Figure 1.5: Research questions

The first subsidiary research question (*Why is agility needed in humanitarian logistics?*) will contribute to filling the first research gap through the categorisation and a better understanding of the nature of the risks and uncertainties that may disrupt the flow of humanitarian supplies. A more structured knowledge of the challenging and constraining factors limiting logistics operations is necessary in order to explain the need for agility in the humanitarian context.

The second research question (*Which organisational capabilities are critical to the ability of humanitarian organisations to build and maintain supply chain agility?*) will address the second research gap by delineating supply chain agility as a system-wide concept that requires a strategic perspective. In parallel, the strategic foundations of agility will be identified, namely the core characteristics required by humanitarian organisations in order to support field work and enhance operational agility.

The third research question (*How do humanitarian organisations develop the organisational capabilities required to build and maintain supply chain agility?*) will further address the second research gap by studying the strategic dimensions of agility in greater depth and by identifying the respective components of these dimensions, i.e. the leadership and management inputs required to develop agility and support effective field operations.

The fourth research question (*To what extent does organisational capacity building impact on operational agility in the humanitarian logistics context?*) will also cover the

second research gap by exploring the direct relationship between the strategic and operational dimensions of agility. Specifically, the effect of organisational capacity building on field responsiveness and flexibility will be measured in order to gain a better understanding on how the strategic and operational levels of a humanitarian organisation interact in order to create supply chain agility.

The fifth research question (*Are agile practices required in humanitarian protracted operations?*) will address the third research gap by investigating the operational environment of protracted operations. By doing so, it will be determined if supply chain agility is an important requirement in such operations.

Thus, this research takes a comprehensive and broader approach to the concept of agility in humanitarian logistics by (1) embracing a strategic perspective that goes beyond the literature's current focus on operations and (2) by extending agility beyond emergencies into the area of protracted operations.

1.3.2. Linking research questions to the published work

This thesis forms a capstone to previous, extended investigations conducted within the PhD project from November 2012 to November 2015. In particular, the doctoral work contains six fully refereed papers prepared during the candidature period. The research presented in these papers as well as their respective findings are synthesised in Section 4.1, and the actual publications are reproduced in Chapter 6. Four of the papers have been published and two have been accepted for publication.

This capstone thesis is designed to demonstrate that the above-mentioned papers constitute essential parts of a coherent and integral body of work related to a single research project and a set of related questions. As indicated in Table 1.2, the six papers included in this thesis are linked thematically to the research gaps presented in Section 1.2 and to the research questions formulated in Section 1.3.1.

Research questions	Research gaps addressed	Related papers
1. Why is agility needed in humanitarian logistics?	Research gap #1	Paper I Paper II Paper VI
2. Which organisational capabilities are critical to the ability of humanitarian organisations to build and maintain supply chain agility?	Research gap #2	Paper III Paper IV
3. How do humanitarian organisations develop the organisational capabilities required to build and maintain supply chain agility?	Research gap #2	Paper III Paper IV Paper V
4. To what extent does organisational capacity building impact on operational agility in the humanitarian logistics context?	Research gap #2	Paper V
5. Are agile practices required in humanitarian protracted operations?	Research gap #3	Paper VI

Table 1.2: Linking the papers to the research gaps and the research questions

1.4. Outline of the thesis

This research increases and deepens the understanding of the concept of agility in the humanitarian logistics context. More specifically, it not only demonstrates that agility is a built-in characteristic of humanitarian organisations that transcends the technical, functional, and operational levels, but also that it is required in contexts other than emergency responses. In doing so, this study opens new avenues for the improvement of the humanitarian practice and, in particular, for the enhancement of the preparedness and response activities.

Figure 1.6 represents graphically the structure of this thesis. After having introduced the general topic of this study, identified research gaps, and formulated a set of associated questions in Chapter 1, the remainder of this thesis is organised as follows. Chapter 2 discusses the theoretical framework of this study and, in particular, the systems theory that is underlying throughout the whole research (Section 2.1), as well as the dynamic capabilities model that supports this research's strategic approach to supply chain agility (Section 2.2). The need to go beyond these theories and to adopt a theory-building approach to agility in humanitarian logistics is also discussed (Section 2.3). Chapter 3 provides details on the methods and materials used in this research and, specifically, on the methodological framework chosen for the study (Section 3.1). The

approach selected to collect both qualitative and quantitative data (Section 3.2) and to analyse these data (Section 3.3) is also discussed. Chapter 4 focuses on the results published in the framework of this research. The findings reported in the respective publications are summed up in Section 4.1, and their contributions are presented in Section 4.2. The results are discussed in Chapter 5. In particular, the research-focused, theoretical, and practical implications of the research are presented in Section 5.1. The constraints and limitations of this study are also addressed (Section 5.2), future research avenues are recommended (Section 5.3), and final observations are provided (Section 5.4). Section 6 reproduces each of the papers included in this thesis.

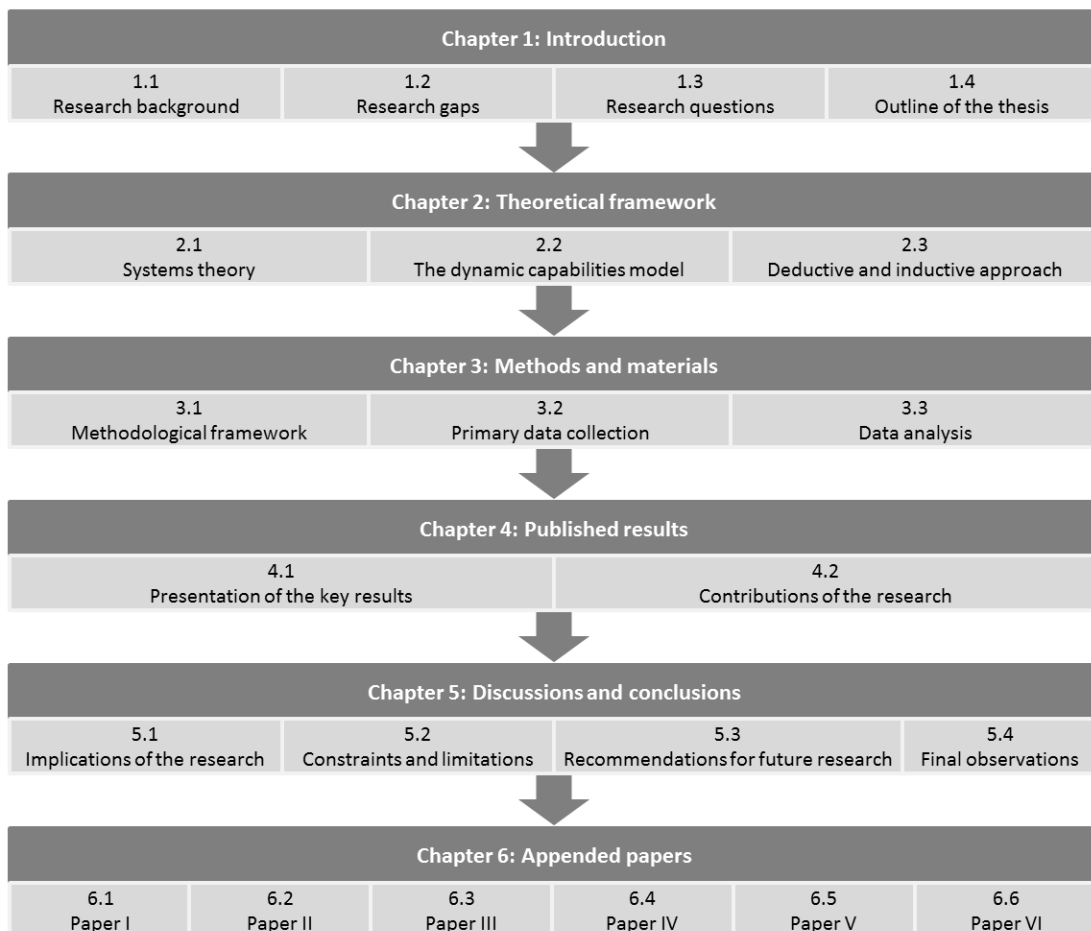


Figure 1.6: Thesis outline

As illustrated below, the next chapter will focus on the theoretical framework of this study. It will present the theories that underpin the research and its conceptualisation. It will also explain why a process of both deduction and induction is required in order to

investigate and capture the multiple facets of the concept of agility in humanitarian logistics.

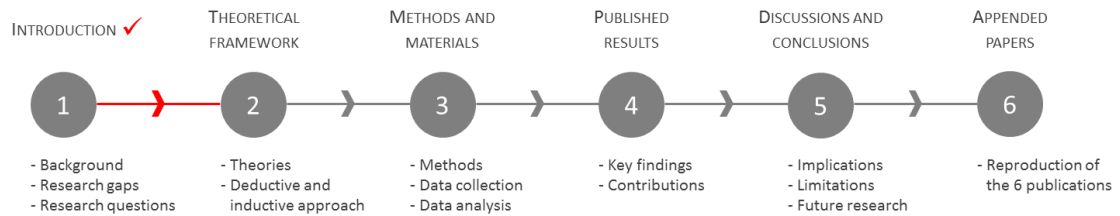


Figure 1.7: Progress tracker – Moving to Chapter 2

2. THEORETICAL FRAMEWORK

This research draws on existing theoretical foundations and, in particular, on systems theory and on the dynamic capabilities model. Chapter 2 presents these two theories as well as their respective contributions to the research. It also explains why it is necessary to go beyond these theories and to adopt an inductive approach in order to develop the theory of organisational agility in humanitarian logistics.

2.1. Systems theory

2.1.1. The components of a system

As defined by Ackoff (1971, p. 662), ‘a system is a set of interrelated elements’. Interconnections between elements hold the system together and maintain its wholeness. In addition to being an integrated whole, a system can be self-organising and self-regulating, i.e. have a life and a pattern of behaviour of its own (Ackoff *et al.*, 2010; Wright and Meadows, 2012). As interconnections between a system’s elements do not occur linearly, but in a complex, simultaneous and multidimensional way, systems must be studied holistically and in their entirety in order to avoid silos and a reductionist approach (Ackoff, 1973; Wright and Meadows, 2012; World Economic Forum, 2013).

Systems exist within systems (Ackoff, 1973) and these subsystems are related to each other, i.e. they can influence and respond to each other (Ackoff, 1971). As illustrated in Figure 2.1, three system levels are relevant to this research. These are (1) the logistics operation level, (2) the organisation level, and (3) the supply network level. Each of these systems is a set of interrelated elements and is interconnected to the other system levels. Whilst the three systems presented in Figure 2.1 are, to some extent, part of this research, the main system of interest is the humanitarian organisation (System 2) in relation to the humanitarian logistics operation (System 1) because increasing organisational agility is, ultimately, designed to improve operational outcomes. Understanding the supply network system (System 3) is, nevertheless, valuable in order to understand how humanitarian organisations relate to each other.

The various elements and relationships making up a system work together towards a common purpose (Forrester, 1990). Whilst a system’s purpose is not always explicit, an unclear purpose can usually be deduced by observing the behaviour of the system (Wright and Meadows, 2012), i.e. the transformation process of inputs (everything the system needs to function) into outputs (everything the system releases) (Daellenbach

and McNickle, 2005). In relation to the system levels represented in Figure 2.1, the purpose of a humanitarian logistics operation is to provide assistance to those affected by a disaster and, more specifically, to make the right relief items available at the right place, time and cost (Van Wassenhove, 2006; Fenton *et al.*, 2014). Humanitarian organisations have various purposes such as supporting food security and nutrition (WFP, 2015d), providing medical assistance (MSF, 2015), protecting children (Save the Children, 2015), or safeguarding the rights and well-being of refugees (UNHCR, 2015). At the level of the humanitarian supply network, organisations endeavour to work together in order to achieve the higher common purpose of saving lives, alleviating human suffering, as well as maintaining and protecting human dignity (Development Initiatives, 2015).

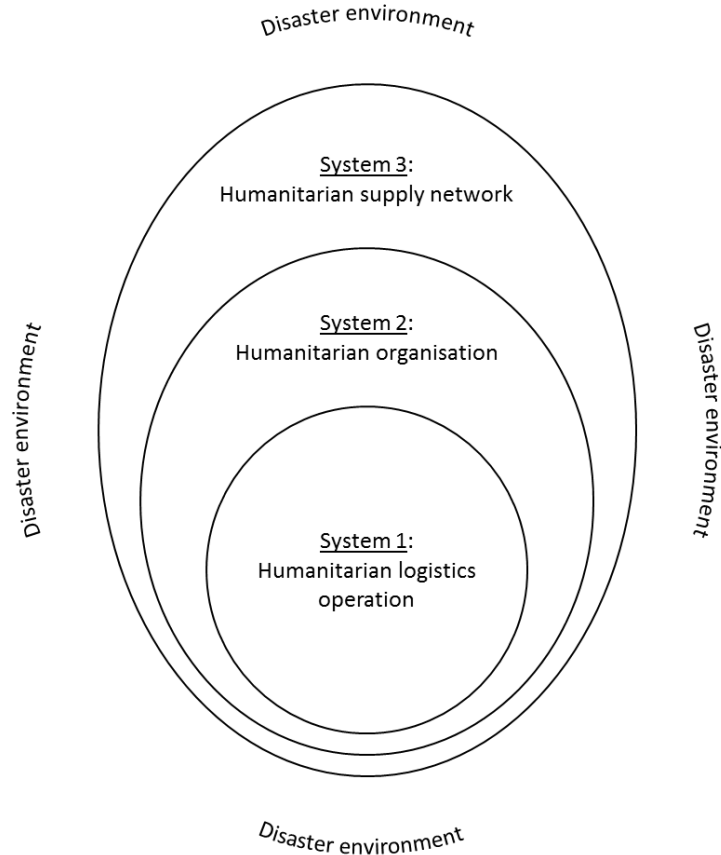


Figure 2.1: System levels

Daellenbach and McNickle (2005) explain that everything occurs within a context and, therefore, consider the external environment as an essential part of the analysis of a system in addition to the above-mentioned components, i.e. the system's elements, non-linear interconnections, and a purpose. Thus, whilst a system has established

boundaries within which everything is interconnected (Forrester, 1990), it cannot be studied in isolation from its environment. This view is consistent with von Bertalanffy's (1972, p. 417) definition of a system as 'a set of elements standing in interrelation among themselves and with the environment'.

The external environment is not part of the system itself but the environment's variables impact on it (Ackoff, 1971). More specifically, an external event may trigger a particular behaviour of the system (Wright and Meadows, 2012), the environment may provide the system's inputs and/or receive the system's outputs (Daellenbach and McNickle, 2005), or the system's performance may be influenced by its external environment (Ackoff, 1973). A system that interrelates with its external environment is called an open system (Ackoff, 1971). Organisations are open systems, i.e. they are part of an environmental context that Teece (2007) calls the 'ecosystem'.

In the humanitarian context, environmental forces impact significantly on logistics operations. Most frequently, externalities are disruptive forces hindering the continuity of humanitarian deliveries. According to Van Wassenhove (2006), such external forces include, for example, the poor condition of the local infrastructure delaying transport operations, as well as decisions/actions of local/national authorities causing bottlenecks in the delivery process. Understanding the external environment is, therefore, essential in order to establish the context and to understand that humanitarian logistics operations are conducted within a prevailing disaster environment that generates a number of contextual challenges impacting on relief performance. The systems presented in Figure 2.1 are, therefore, open systems and, as will be further explained in Section 2.1.3, the external environment cannot be ignored when conducting research on agility in humanitarian logistics.

2.1.2. Making decisions in complex and dynamic environments

System complexity and dynamism are the hallmark of today's world (Richardson, 1994; Daellenbach and McNickle, 2005; World Economic Forum, 2013). Complexity results from the presence of a large number of elements making up a system, whereas dynamism is caused by tight coupling between these elements (leading to rapid and cascading changes), ambiguous cause-and-effect relationships, as well as non-linear effects (Senge, 2006; Sull, 2009). Since complexity and dynamism generate unpredictability and impede informed decision making (Daellenbach and McNickle, 2005), Ackoff (1974) refers to such a situation as a 'mess'.

In the humanitarian logistics context, such 'messes' unquestionably and frequently exist, and the complexity/dynamism prevalent in humanitarian systems has been widely discussed in the academic literature. For example, a number of authors (Van

Wassenhove, 2006; Besiou *et al.*, 2011; Tatham and Houghton, 2011) mention multiple problem origins, multidimensional interconnections, unclear cause-and-effect relationships, as well as the uniqueness of each disaster situation as some of the sources of complexity and dynamism. According to Gonçalves (2008) and to Tatham and Houghton (2011), one way of addressing and managing such humanitarian problems is to gain a broader understanding and to embrace their complexity/dynamism by taking a systems perspective.

Other authors have used a systems perspective and, thereby, demonstrated its applicability to the humanitarian logistics discipline. For example, Blecken (2010a) applies systems theory and systems modelling in order to help humanitarian organisations design, plan and implement better supply chain processes for their operations. Heaslip *et al.* (2012) use a systems approach and develop a systems dynamics model in order to understand the complexity of the relationships between military and civilian organisations involved in disaster relief, as well as to improve the coordination of their operations. Along the same lines, Fawcett and Fawcett (2013) use the fundamental principles of systems thinking in order to take a more comprehensive perspective to the design of humanitarian systems, to identify avenues for improving the ongoing planning and coordination of efforts between the various humanitarian supply chain participants, and, ultimately, to achieve a more cohesive response.

Although academics (such as those mentioned above) have called for a systemic approach to problem solving and decision making, systems thinking is, to date, not very common in organisations (commercial, governmental or non-governmental) where decision makers tend to simplify problems and solutions by adopting a narrow focus (Ackoff *et al.*, 2010). As explained by Ackoff *et al.* (2010, p. 6), ‘systems thinking looks at relationships (rather than unrelated objects), connectedness, process (rather than structure), the whole (rather than just its parts), the patterns (rather than the contents) of a system, and context’. It is, therefore, a different and more comprehensive approach to examining and understanding phenomena that challenges decision making and practices in organisations (Ackoff, 1973; Daellenbach and McNickle, 2005).

In contrast, fragmentation prevents decision makers from considering how the individual elements of a system interact with each other (Forrester, 1990). Therefore, solving a problem by breaking it down into smaller individual parts, analysing them, and fixing the defective one is suboptimal (Ackoff, 1973; Ackoff *et al.*, 2010). Ackoff (1973) further argues that even if all the individual parts of a system achieve the highest possible level of performance, the system as a whole does not necessarily perform well if the parts do not fit and work together synchronously.

Since an organisation is a system, breaking it down into smaller individual functions and operations, and focussing on local improvements at the sub-system level is not an

appropriate approach if the aim is to improve the performance of the whole organisation. Indeed, such a silo approach ignores cross-functional interactions and does not identify root causes that impact at multiple levels within the organisation. In other words, the sum of local/functional improvements does not equal system improvement, i.e. improvement at the organisational level (Daellenbach and McNickle, 2005; Walsh, 2010).

2.1.3. Contribution of systems theory to this research

Systems theory serves as one of the theoretical underpinnings for this research and, in particular, highlights the importance (1) of integrating the external environment into the analysis of agility, and (2) of extending the study of agility to the broader organisation level (i.e. System 2 in Figure 2.1). In regard to these two points, it will first be recalled from Chapter 1 that the humanitarian logistics literature on agility focuses primarily on supply chain-related risks and uncertainties (i.e. in relation to demand, supply and processes), and rarely studies agility as a response to externalities. Thus, systems theory is used in this research to demonstrate that humanitarian operations are significantly influenced by their external context and, therefore, that supply chain agility cannot be studied appropriately without embracing the complexity of the whole disaster situation and of the environmental circumstances. In other words, the study of supply chain agility must extend to the ecosystem level.

Secondly, it is argued that focusing on individual functions (in particular, logistics) and/or individual operations in order to achieve supply chain agility is suboptimal. This is because problems are often not local, but systemic (Walsh, 2010) and because system instability frequently originates from the system's internal behaviour (Forrester, 2007a). Thus, systems thinking is used in this research as a way of better identifying the causes of problems as well as new opportunities to tackle them (Wright and Meadows, 2012). More specifically, systems theory supports a widening of the focus of agility from its current operational scope to the broader system level, as well as the investigation of the organisational determinants of supply chain agility. Studying agility as a system (i.e. organisational) strategy has the potential to open up new avenues for its development in the humanitarian logistics context.

Thinking at the system/organisational level is also a way of approaching problems from a long-term perspective instead of focusing on short-term solutions. Systems theory is, thus, helpful in diagnosing and eliminating the causes, rather than simply reducing the symptoms of a given problem (Ackoff, 1974; Forrester, 2007b). In other words, building solutions at a higher system level helps managers move from the survival or firefighting mode of decision making to more structured and lasting solutions (Walsh, 2010). In

relation to this research, systems theory is, therefore, used to switch the focus of agility from ad hoc and creative problem solving at the logistics operation level (System 1 in Figure 2.1) to the longer-term building and internationalisation of an adaptive capacity at the organisational level (System 2).

2.2. The dynamic capabilities model

2.2.1. Presentation of the model

In addition to systems theory, this research draws on Teece's dynamic capabilities model (Teece and Pisano, 1994) in order to examine the concept of agility in the humanitarian logistics context. The dynamic capabilities model evolved from the resource-based view of the firm (RBV) according to which, organisations achieve superior performance and a competitive advantage by possessing unique attributes, i.e. valuable, rare, difficult to imitate, and non-substitutable resources. These resources are often complex and cannot be easily understood and identified and, therefore, explain the variations in performance between organisations in the same industry (Barney, 1991; Lockett *et al.*, 2009). Whilst the RBV is frequently commended for its emphasis on strategic resources as a potential source of competitive advantage (Priem and Butler, 2001), it has also been argued that it is not fully appropriate for organisations operating in changing and unpredictable environments (Olavarrieta and Ellinger, 1997; Priem and Butler, 2001). This is because the RBV focuses on the possession and control of resources and fails to consider their (re)combination and (re)configuration as a source of value (Teece *et al.*, 1997; Teece, 2007). The RBV is also criticised for being too vague to be actionable by practitioners (Teece *et al.*, 1997; Priem and Butler, 2001). These limitations have, at least in part, been addressed by the dynamic capabilities model.

Extending the RBV, Teece and Pisano (1994) as well as Teece *et al.* (1997) argue that neither good/poor performance nor the success/failure of an organisation can be solely accounted for by the development of internal resources, and that organisations need to develop dynamic capabilities. Teece *et al.* (1997, p. 516) define dynamic capabilities as 'the firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments'. This definition makes it clear that the dynamic capabilities model takes a more comprehensive approach to resource building by integrating changes and unpredictability into the analysis. Thus, according to Teece (2007), operational and technical expertise is not sufficient to achieve good performance and must, rather, be combined with external fitness, i.e. the ability to cope with ever changing environments. In other words, good operations management

at the sub-system level (e.g. order processing, purchasing, logistics, inventory control, sales, etc.) must be supported by dynamic capabilities at the broader system (i.e. organisational) level in order for an organisation to be able to adapt swiftly to changes in its environment (Teece, 2007).

Although Teece's dynamic capabilities model is pre-eminently about gaining a sustainable competitive advantage, i.e. developing difficult-to-imitate competences in order to achieve superior profitability, its focus on timely responsiveness to disruptive forces (Teece and Pisano, 1994; Teece *et al.*, 1997; Teece, 2007) is appropriate in order to study the concept of supply chain agility. A number of research works on this topic (e.g. Chiang *et al.*, 2012; Gligor, 2013; Gligor and Holcomb, 2014) have, indeed, been guided by the dynamic capabilities model and have demonstrated the appropriateness and usefulness of this model to address the complexity and dynamism existing in supply chain operations. In addition, Helfat *et al.* (2007) argue that the model is applicable to non-profit organisations that operate in complex and dynamic environments and that need to redeploy and reconfigure their resources in order to adapt to these challenges, as is the case of humanitarian organisations.

2.2.2. Contribution of the dynamic capabilities model to this research

Humanitarian organisations must manage multiple and ongoing changes that include both those that are routine and those that are novel. Such changes do not only occur within the context of a particular humanitarian operation, but also across operations. This is because humanitarian organisations are typically involved in temporary supply chains organised in response to time-specific disaster situations (Merminod *et al.*, 2014), and conduct their work in multiple countries, multiple disaster environments, and through multiple supply networks. As a consequence, humanitarian organisations must constantly redeploy and reconfigure their resources (Merminod *et al.*, 2014) and each individual operation constitutes a specific environment to which they must adapt rapidly, and in which unique solutions need to be found and appropriate decisions need to be made (Tatham and Houghton, 2011).

Since humanitarian organisations are required to stretch their efforts and their limited resources, the challenge that they face is not only to optimise their available resources in the short term and within a specific operation, but also to develop an internal capacity that enables them to build enduring performance for the longer term and across operations (Gonçalves, 2011). Organisational capacity building is, indeed, essential since humanitarian organisations need to go through changes in the most effective manner and to move from one disaster environment to another, as much as possible, without loss of performance. In other words, operational agility is not

sufficient and humanitarian organisations should also focus on building and sustaining a system of organisational agility.

The dynamic capabilities model supports this view by arguing that good performance stems from closely integrating an organisation's operational and strategic capacity levels (Helfat *et al.*, 2007; Helfat and Winter, 2011). In other words, it is argued that performing well in field logistics goes beyond building operational expertise and depends on the support provided by a number of dynamic capabilities developed and maintained at the organisational level. As a consequence, the dynamic capabilities model is used in this research in order to support the development of four foundational capabilities (being purposeful, being action-focused, being collaborative, and being learning-oriented) that enable humanitarian organisations to adapt to the multiple constraints and disruptions imposed by the humanitarian environment.

Teece (2007, 2009) argues that dynamic capabilities are based on the ability to develop, (re)combine and (re)configure a number of resources (or 'micro-foundations') that underpin the capabilities. This ability is also called resource fluidity in the literature (Doz and Kosonen, 2008b). Resources are diverse and include, for example, skills, processes, systems, decision rules, and structures. Thus, in addition to highlighting the need for higher level capabilities, the dynamic capabilities model provides a framework that explains how to enhance and leverage resources in order to ensure that a humanitarian organisation, as a system, responds rapidly and effectively to the changes encountered in the field and across operations.

2.3. Deductive and inductive approach

2.3.1. Beyond systems theory and the dynamic capabilities model

Consistent with the observations of Ali and Birley (1999), prior theoretical knowledge is used in this study to shape the conceptual design of the research, identify the relevant links, and delineate the areas of investigation. Systems theory and the dynamic capabilities model are, nevertheless, insufficiently thorough and prescriptive to capture the complexity of the underlying mechanisms of agility in humanitarian logistics and to provide a clear action plan for humanitarian organisations seeking to increase their agility.

Whilst systems theory provides a helpful framework to explore agility in humanitarian logistics, it is insufficient to understand how a humanitarian organisation, as a system, should function in order to build and maintain agility. According to Wright and

Meadows (2012), understanding how systems work, how they produce results, and how to improve them implies developing a clear understanding of their structure and of their behaviour. Therefore, this research needs to take a theory-building approach in order to gain a deep insight into the systems mechanisms that support agility in humanitarian logistics.

In addition, whilst the dynamic capabilities model establishes that organisations need to develop foundational capabilities to adapt swiftly to changing environments and to improve their performance, the nature of the dynamic capabilities as well as the way that they should be built differ from industry to industry and the type of value to be captured (Teece, 2000). As a consequence, further theory-building research is needed in order to gain a better understanding of the nature and the underlying mechanisms of the dynamic capabilities that support agile logistics operations in the humanitarian context.

It follows from the above discussion that this research needs to integrate both a deductive and an inductive perspective. As noted by Ali and Birley (1999), combining both approaches amounts to building models based on constructs while allowing for the details of the linkages to be discovered. Doing so is all the more appropriate as this research not only describes what agility in humanitarian logistics is, but also demonstrates how agility can be developed. In other words, this research takes not only a descriptive, but also a prescriptive approach to theory building (Christensen and Carlile, 2009) in order to provide the basis for a clear line of action for humanitarian organisations. Figure 2.2 illustrates this research's theoretical approach.

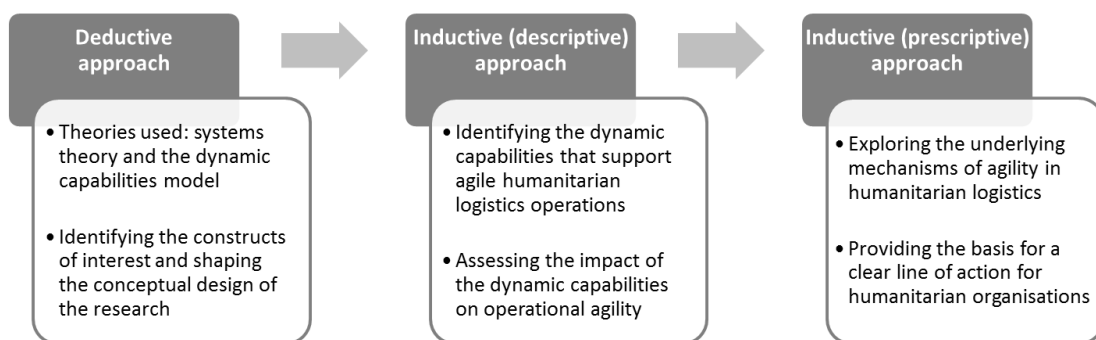


Figure 2.2: Theoretical approach

The descriptive phase of building the theory of organisational agility in humanitarian logistics involves identifying the set of strategic level capabilities that enhance agility as well as assessing their impact on operational agility. However, as the essence of a

theory is to be predictive and to understand why the studied phenomenon occurs (Saunders *et al.*, 2009), research must explain the causes of the outcome of interest and the specific set of circumstances that leads to it (Christensen, 2006). Therefore, explanations as to why the identified capabilities contribute to operational agility in humanitarian logistics will be provided by identifying the set of actions supporting the development of these capabilities.

This approach is in line with Whetten's (1989) work on what constitutes a theoretical contribution. In particular, Whetten (1989) describes the essential elements to be considered when developing, or evaluating the development of, theories in the organisational sciences. The first of these elements (which Whetten calls 'what') is the identification of the set of factors (i.e. variables, constructs, or concepts) included in the theory. The second element (called 'how') relates to the identification of relationships between the previously identified factors. The third element (called 'why') explains the mechanisms underlying these relationships. Thus, according to Whetten (1989), whilst 'what' and 'how' describe, 'how' explains.

These three elements are included in the theory development approach taken in the current research. The research identifies a set of factors (the 'what' elements) in the form of four strategic level capabilities (i.e. being purposeful, being action-focused, being collaborative and being learning-oriented, collectively referred to as organisational capacity building) and two operational outcomes (i.e. responsiveness and flexibility, collectively referred to operational agility). The research also establishes the relationships between these factors (the 'how' elements) by assessing the impact of organisational capacity building on operational agility. The subsequent exploration of the mechanisms underpinning these relationships, i.e. understanding the reasons why they occur, reflects Whetten's (1989) 'why' element.

In summary, whilst this project draws on existing theories and research, it also includes a theory-building approach. Thus, in its first stage, this research will take a deductive approach and use the theoretical foundations derived from systems theory and the dynamic capabilities model in order to delineate and explore the broad constructs of interest and, in particular, organisational capacity building and operational agility (responsive and flexible logistics operations). In its second stage, the research will move to an inductive approach. At this point, it will not only define the constructs at a greater level of detail by identifying a set of four strategic level capabilities, but also establish and quantify the relationships between the constructs, as well as explain why organisational capacity building contributes to operational agility. By doing so, this research will build the foundations of the theory of organisational agility in humanitarian logistics.

2.3.2. The theoretical approach of the publications

With the above discussions in mind, Table 2.1 presents the theoretical framework underpinning the six papers of this research. In particular, the table identifies the nature of the work undertaken (conceptual or research), the aim of each paper in relation to this project, the theoretical approach (deductive and/or inductive), the underlying theories, as well as the way the theories have been used and/or further developed.

Thus, as indicated in Table 2.1, the theories presented in this chapter, i.e. systems theory and the dynamic capabilities model, have guided the research work undertaken in this study but have been further developed in order to adapt them to the particular context of humanitarian logistics operations. This theoretical approach underpins the methodological choices made, as will be further explained in the next chapter. Thus, as illustrated below, the third chapter of the thesis will focus on the various research methods and materials used in this study. In particular, it will explain how qualitative as well as quantitative data collection and analysis techniques have been used in order to support the deductive and inductive approaches described in this chapter as well as to address the research gaps and the research questions formulated in Chapter 1.

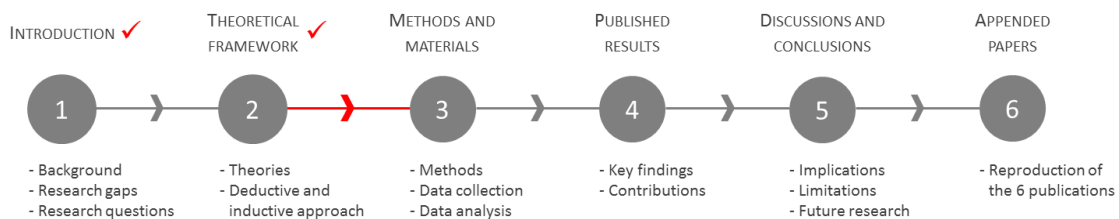


Figure 2.3: Progress tracker – Moving to Chapter 3

Paper	Nature of the paper	Aim of the paper in relation to the project	Theoretical approach	Underlying theory	Theory use and/or development
I	Conceptual paper	Classifying disaster situations in order to understand the diversity of humanitarian logistics operations	N/A	Systems theory	Although the paper does not include an explicit theoretical perspective, it implicitly takes a systems approach in order to: (1) present disasters as complex and heterogeneous phenomena, (2) categorise the external forces impacting on logistics operations, and (3) highlight the need to study disasters by embracing the complexity of the whole situation and circumstances.
II	Conceptual/ Research paper	Highlighting the significant level of complexity and dynamism in humanitarian logistics operations	Deductive	Systems theory	The paper makes use of the general system theory in order to: (1) present a disaster as an open system characterised by complexity and dynamism, (2) highlight the significant negative impact of the disaster's external environment on logistics operations and, ultimately, (3) argue that external situational factors are an integral part of the humanitarian logistics response.
III	Conceptual paper	Shifting the current focus of agility in humanitarian logistics from operational matters to strategic matters	Deductive/ Inductive (descriptive)	Systems theory/ Dynamic capabilities	In this paper, a systemic view of the humanitarian organisation is taken in order to demonstrate that supply chain agility requires an organisational approach that goes beyond operations. The paper also draws on the dynamic capabilities model to establish that agility stems from strategic decisions. However, the paper goes beyond these theoretical frameworks and uses the existing business literature in order to identify a set of four strategic level capabilities that support agility in humanitarian logistics.
IV	Research paper	Exploring the underlying strategic mechanisms of agility in humanitarian logistics	Inductive (prescriptive)	Systems theory/ Dynamic capabilities	A systems view of agility in the humanitarian logistics context underlies this paper's analysis. The paper extends the dynamic capabilities model by: (1) exploring the relevance of the four previously identified dynamic capabilities to the humanitarian context, and (2) examining how these strategic dimensions contribute to the agility of humanitarian logistics operations.
V	Research paper	Quantifying the impact of organisational capacity building on operational agility	Inductive (descriptive + prescriptive)	Systems theory/ Dynamic capabilities	The paper identifies a set of actions associated with the four dynamic capabilities previously identified in order to measure these capabilities and assess their collective impact on operational agility. The paper concludes that building agility in humanitarian logistics requires a systemic approach integrating a number of strategic level forces that are closely intertwined and must be developed simultaneously.
VI	Research paper	Describing the logistics environment of humanitarian protracted operations and investigating the need for agility in such operations	N/A	Systems theory	Whilst the paper does not refer explicitly to any theoretical framework, the analysis derives from the systems approach taken in the first and the second papers and, in particular, their focus on the importance of the external environment in humanitarian operations. On this basis, the paper demonstrates that agility is an important requirement in protracted operations.

Table 2.1: Theories associated with the publications

3. Methods and materials

This chapter focuses on the methods selected for this research, and explains how and why data have been collected. It also explores the relationship between the theories presented in the previous chapter and the need for both qualitative and quantitative data collections and analyses.

3.1. Methodological framework

3.1.1. Mixed-method research

A number of academics have argued that there is a lack of empirical research in the field of humanitarian logistics (Tatham *et al.*, 2009; Heigh and Jahre, 2010; Everywhere *et al.*, 2011; Kovács and Spens, 2011a; b; Holguín-Veras *et al.*, 2012; Kunz and Reiner, 2012). Going one step further, Professor Jahre, interviewed by Johansen and Lie (2011), raises concern over the quality of the empirical data used in some academic research. It is clear, therefore, that more practice-oriented and rigorous investigations are needed in the humanitarian logistics discipline (Kovács and Spens, 2011a; b).

With this in mind, and in order to gain a more complete understanding of the concept of organisational agility in the humanitarian logistics context, this study uses a mixed-method approach, i.e. it combines both qualitative and quantitative data collection and analysis techniques (Saunders *et al.*, 2009). Such a combination of multiple sources of evidence to describe and analyse a common research phenomenon is also called methodological triangulation in the literature (Jick, 1979; Yin, 2003). In this study, mixed-method research is used to better understand how a humanitarian organisation, as a system, functions and creates agility along the supply chain.

According to Jick (1979) and to Johnson and Onwuegbuzie (2004), quantitative and qualitative research approaches can be complementary, and their concurrent use enables researchers to capitalise on the strengths and to compensate for the weaknesses of each approach. This increases validity and accuracy and, therefore, provides better research outcomes in social sciences. Specifically, whilst a quantitative approach enables researchers to test and quantify the relationships between given inputs and outputs, qualitative research is used to enrich and illuminate the statistical relationships. In other words, combining these methods to study a phenomenon of interest provides a more complete picture and adds insights, namely precision through the quantitative analysis and meaning through the qualitative analysis (Johnson and Onwuegbuzie, 2004).

In this research, a mixed-method approach is used not only to quantify the statistical relationship between organisational capacity building and operational agility, but also to investigate and explain why organisational capacity building positively impacts on operational agility. Thus, as observed by Jick (1979), no single methodological approach is sufficient in itself and, to address the questions underpinning this study and achieve greater confidence in the results, it is necessary to leverage the respective benefits of the qualitative and quantitative approaches. Table 3.1 presents an overview of the methodological choices made in each of the six publications included in this thesis. In particular, the table indicates how the research questions presented in Chapter 1 will be addressed from a methodological perspective.

Paper	Research questions	Purpose	Research approach	Research strategies
I	#1 Why is agility needed in humanitarian logistics?	Exploratory	Qualitative	Literature review
II	#1 Why is agility needed in humanitarian logistics?	Exploratory/ Descriptive	Qualitative	Literature review, Illustrative case study
III	#2 Which organisational capabilities are critical to the ability of humanitarian organisations to build and maintain supply chain agility? #3 How do humanitarian organisations develop the organisational capabilities required to build and maintain supply chain agility?	Exploratory/ Descriptive	Qualitative	Literature review
IV	#2 Which organisational capabilities are critical to the ability of humanitarian organisations to build and maintain supply chain agility? #3 How do humanitarian organisations develop the organisational capabilities required to build and maintain supply chain agility?	Exploratory	Qualitative	Interviews (case study)
V	#3 How do humanitarian organisations develop the organisational capabilities required to build and maintain supply chain agility? #4 To what extent does organisational capacity building impact on operational agility in the humanitarian logistics context?	Explanatory	Quantitative	Online survey
VI	#1 Why is agility needed in humanitarian logistics? #5 Are agile practices required in humanitarian protracted operations?	Descriptive	Quantitative/ Qualitative	Interviews, Online survey (case study)

Table 3.1: Methodological framework

Consistent with the mixed-method research paradigm, and given this study's effort to take a comprehensive and systemic approach to agility, this research follows on an exploratory, descriptive and explanatory approach. Exploratory research investigates the context and the nature of the studied phenomena. It enables the researcher to make sense of the study background, and provides a clear direction for the research (Saunders *et al.*, 2009). In this study, exploratory research is conducted in order to investigate the context and the nature of agility in humanitarian logistics. This will be achieved by collecting and analysing qualitative data, i.e. by searching the literature as well as by using a case study approach, which includes conducting interviews with experts.

Descriptive research investigates the characteristics of the phenomena of interest to obtain a clearer and more accurate picture (Saunders *et al.*, 2009). Thus, descriptive research, both qualitative and quantitative, is undertaken in this study in order to clearly delineate and depict the concept of organisational agility in humanitarian logistics and, at a later stage in the research process, to identify the logistics features of humanitarian protracted operations. To these ends, literature reviews, case study research and descriptive statistics are used.

Explanatory research is designed to establish causal relationships by measuring and explaining the studied phenomena (Saunders *et al.*, 2009). In this study, explanatory research is conducted by undertaking a quantitative analysis of the results of an online survey in order to quantify the causal relationship between organisational capacity building and agile humanitarian logistics operations.

The combination of exploratory, descriptive and explanatory research, as well as the concurrent use of qualitative and quantitative methods are essential to support this study's deductive and inductive approach and, ultimately, to build the foundations of the theory of organisational agility in humanitarian logistics (as explained in Section 2.3). The way in which the methods used in this research support an iterative theory development process is illustrated in Figure 3.1.

Thus, as recommended by Jick (1979) and Eisenhardt (1989), existing theories as well as qualitative data derived from prior literature are initially used to delineate the conceptual framework of agility and identify the organisational and operational constructs of interest. Then, qualitative empirical research is undertaken in order to reveal emergent relationships between the organisational and operational components of agility, identify the rationale behind these relationships, and formulate hypotheses. Subsequently, quantitative empirical data is used to test these hypotheses, measure the identified relationships and, ultimately, strengthen the emergent theory of organisational agility in humanitarian logistics.

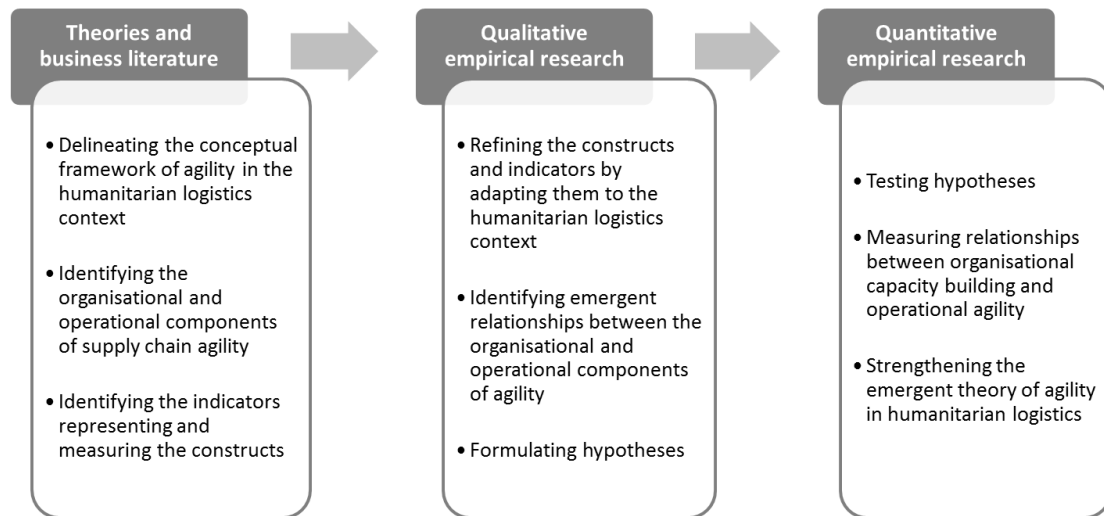


Figure 3.1: The emergence of the theory of agility in humanitarian logistics

3.1.2. Case study research

In order to ground this research in the reality of the humanitarian work, case studies are used at several stages of the research process. Firstly, the 2011-2012 Somali food crisis is used in Paper II in order to investigate the details of a disaster environment. In particular, this case study is designed to demonstrate that disasters are complex phenomena that require a systems approach as well as to provide a practical illustration of the importance of integrating the external environment of a disaster into the analysis of humanitarian logistics operations. In this case study, qualitative evidence is collected from secondary data and, in particular, from the UN Logistics Cluster's field reports related to the 2011-2012 operation in Somalia.

Secondly, the UN World Food Programme (WFP) is the focus for the research reported in Paper IV. In this case study, a qualitative analysis of interview data is conducted in order to explore and understand how humanitarian organisations build and maintain supply chain agility in order to overcome and/or mitigate uncertain and unstable field events. In particular, this case study is designed to gain a robust understanding of the strategic determinants of supply chain agility in humanitarian operations. Thirdly, WFP is also the unit of analysis of a case-based approach in Paper VI. In this paper, qualitative and quantitative data is collected through interviews with, and an online survey of, humanitarian logisticians currently (or previously) involved in protracted operations in order to gather background information on the logistics environment of such operations.

The primary case study focus, WFP, is a UN agency headquartered in Rome, Italy, and which specialises in the provision of food assistance. In 2014, WFP attracted US\$5.38

billion funding and delivered 3.2 million metric tons of food to 80 million people in 82 countries (WFP, 2015h). WFP's deliveries primarily consist of cereals (86%), mainly in the form of wheat and wheat flour, but also including coarse grains, rice and fortified blended food. The remaining 14% of the deliveries include non-cereal products such as pulses, oils and fats, as well as a growing share of specialised nutritious foods (Drouhin, 2013; WFP, 2013a). To ensure rapid and effective food deliveries, WFP sees logistics as an essential part of its relief operations with an average of 5,000 trucks, 20 ships, and 70 aircraft coordinated every day, as well as 650 warehouses and 700 WFP-owned trucks managed globally (WFP, 2015h).

Thus, WFP has been involved in this research project on account of its proven logistics expertise. This expertise resulted in the organisation being mandated to lead the UN Logistics Cluster, a voluntary coordination body that brings together humanitarian organisations and enhances information sharing as well as collaboration in logistics matters (Logistics Cluster, 2015a). WFP was also acknowledged by the 2014 European Supply Chain Excellence Award in the category 'Austere Environments and Contingency Logistics' (Logistics Manager, 2014).

In addition, WFP has been selected for this research because it is the only organisation that expressly conducts Protracted Relief and Recovery Operations (PRROs), a category of operations on which this thesis partly focuses. WFP's PRROs are designed to re-establish livelihoods in the post-emergency phase of a disaster (WFP, 2015e). Over the course of 2014, WFP was involved in 57 such protracted operations in countries as diverse as, for example, Cuba, Bolivia, Paraguay, Ghana, Chad, Uganda, Palestine, Iraq, Yemen, Nepal, Bangladesh and the Philippines. By comparison, WFP also conducted 39 emergency operations during the same period (WFP, 2015h).

The benefits of using case study research in this project are two-fold. Firstly, case studies enable researchers to conduct concrete investigations and context-dependent research that is relevant to both academics and practitioners (Yin, 2003). In particular, Dijkzeul *et al.* (2013) note that researchers can benefit substantially from working with humanitarian organisations because they provide a better understanding of the reality and the complexity of the humanitarian work. Secondly, case studies contribute to theory building (Eisenhardt, 1989) and are, therefore, an appropriate tool to develop the foundations of the theory of organisational agility in humanitarian logistics. In this regard, Dijkzeul *et al.* (2013) observe that humanitarian organisations can benefit from academic research that provides the analytical distance and rigour necessary to support theory building. This latter point is all the more important as, despite the growing use of theories in the humanitarian logistics literature (Tabaklar *et al.*, 2015), the humanitarian research remains in need of sound theoretical frameworks that not only

promote further research, but also inform practice (Jahre *et al.*, 2009; Dijkzeul *et al.*, 2013). The use of case studies can contribute to this theory-building effort.

That said, two limitations in regard to the focus of part of this research on a single case study (i.e. WFP), as well as their possible impact on the study outcome should be considered. The first limitation relates to the concept of replicability. As noted by Yin (2003), replicating the research using multiple case studies provide a support for seeking convergent evidence, validating or refining the original set of propositions and, ultimately, generating more robust outcomes. In a similar way, Simons (2009) highlights that using multiple case studies enable researchers to conduct a cross-case analysis, i.e. to identify common issues in each case and to derive general propositions across a number of units of analysis. In other words, using multiple case studies supports cross-case generalisation. Since the qualitative part of this research focuses on WFP, the study is grounded in this particular case and does not compare and/or contrast data from different sources. It may, as a consequence, produce knowledge that Flyvbjerg (2006) defines as context-dependent as opposed to theoretical (context-independent).

This context-specific nature of the research leads to the second limitation in regard to the use of a single case study, i.e. that this research might not generate externally valid results. The concept of external validity defines the extent to which the research outcomes are generalisable either to a wider population and/or to contexts or settings beyond the current research design (Saunders *et al.*, 2009). In this respect, it should be noted that humanitarian organisations are highly diverse in regard to their mission, expertise, level of maturity, size, modes of operation, the sources and volume of funds received (Long and Wood, 1995; Kovács and Spens, 2007) and, as a consequence, in the way they build and maintain agility in their logistics operations. The exact mechanisms underlying agility may, therefore, differ from one organisation to another and those identified in relation to WFP may not be fully applicable to all organisations. However, since WFP constitutes a critical case, the overall considerations highlighted in the research are expected to bear relevance to other organisations. The above-mentioned limitations of replicability and generalisability will be further addressed in Section 5.2 that focuses on the constraints and limitations of the current research and in Section 5.3 that considers avenues for further research.

3.2. Primary data collection

As discussed in the previous section, this research combines different sources of evidence in order to build comprehensive knowledge of the concept of agility in the

humanitarian logistics context. This section presents the two stages of the primary data collection, i.e. the interviews of key informants and the online survey of humanitarian logisticians.

3.2.1. Collecting qualitative data through interviews

A total of 29 face-to-face interviews were performed from 12th to 25th June 2014 at WFP's headquarters in Rome (see WFP's letter of invitation in Appendix 1). These individual interviews constitute the main source of primary qualitative data for this research. Consistent with the study's multi-level approach to agility as presented in Section 1.1.3, the interview participants were WFP staff members working at various levels of the organisation, i.e. from the operational to the strategic levels. Among the interviewees, 24 worked in WFP's logistics division and 5 held positions in the departments of Policy, Programme & Innovation, Information Technology, Procurement, as well as Emergency Preparedness. The participants were selected with the help of WFP's logistics senior management on the basis of the research's general intent as well as the quality of the information that the interview participants were likely to provide.

The reasons for conducting the interviews were as follows:

- Better delineating the core concepts of this research (e.g. agility, strategic level capabilities, protracted operations),
- Gaining an in-depth understanding of the organisational mechanisms supporting agile logistics operations,
- Investigating the logistics environment of protracted operations,
- Validating and refining the survey questionnaire used at a later stage of the research in order to collect quantitative data,
- Understanding the functioning and operational language of WFP.

In this regard, it is important to note that academics and humanitarians may have a different approach to humanitarian logistics and do not necessarily talk the same language (Pedraza-Martinez *et al.*, 2013). Learning WFP's vocabulary by interacting with staff members and conducting interviews was, therefore, essential in order to validate the survey questionnaire's accuracy and consistency of language and, ultimately, to ensure that the survey was a valid and reliable data collection instrument. According to Pedraza-Martinez *et al.* (2013), using the right words also increase practitioners' trust in the results and contributes to bridging the gaps between academic research and its application in humanitarian organisations.

Both unstructured and guided interviews were conducted. In unstructured interviews, questions are not predetermined and the interviewer adapts them to the respondent and the natural flow of the conversation. In guided interviews, the interviewer is slightly more constrained by a number of broad questions used as a starting point for the discussion and designed to signpost the interview's overall direction. However, guided interviews do not prevent spontaneous questioning and do not impede the informal and conversational nature of the interview (Olson, 2011).

The use of both unstructured and guided interviews was considered appropriate for this research for two reasons. Firstly, given the diversity of the interview participants, a degree of freedom was needed to adapt the questions to the particular interviewee and to the specific interview context. Secondly, and consistent with the exploratory nature of the research at this stage, it was important not to constrain the scope of the discussion and, thereby, not to exclude unanticipated themes.

The broad topics covered during the interviews included:

- The respondents' understanding of agility,
- The level and the nature of the support provided by the central head offices to the field,
- The creation of agility within WFP,
- The strategic level capabilities supporting agile logistics operations,
- The interviewees' field experience,
- Protracted operations.

The interview questions are provided in Appendix 2. Thirteen interviews were digitally recorded with the consent of the participants. Sixteen interviews were not recorded because the interview environment was not appropriate to recording (for example, due to the background noise) or, mostly, at the request of the interviewees. Some respondents explained that recording the interview would make them feel uncomfortable, unnatural and/or unwilling to speak openly. When interviews were not recorded, detailed notes were taken and written up immediately after the interviews in question. The recorded interviews were transcribed verbatim. The 29 transcripts/reports were the primary source of data for the content analysis described in Section 3.3.1.

3.2.2. Collecting quantitative data through an online survey

The interviews conducted in Rome were used to inform the second data collection stage, i.e. the collection of quantitative data through an online survey. To this end, a questionnaire consisting of four sections was designed. Section A contained general

multiple choice questions related to the profile and experience of the participants. Section B aimed to measure the strategic dimensions of agility and included matrix questions using a 5-point Likert scale. Section C was designed to measure operational performance and, in particular, field responsiveness and flexibility. This section contained matrix questions using a 5-point Likert scale as well as multiple choice multiple select questions. Section D focused on protracted operations and included matrix questions using a 5-point Likert scale in addition to multiple choice multiple select questions.

Consistent with the deductive/inductive approach being used for this research, and as recommended by Saunders *et al.* (2009), the survey questions were both derived/adapted from the existing literature as well as newly developed on the basis of the analysis of the above-mentioned interviews. Since the formulation of good questions is a requirement for the development of valid and reliable measures (Neuman, 2012), the survey questions and instructions were made as clear and simple as possible. Clarity and simplicity relate, among other things, to the precision of language, the order and shortness of the questions, as well as the absence of ambiguity (for example by avoiding double-barrelled questions) (Podsakoff *et al.*, 2003; Robson, 2011).

Before the final administration of the questionnaire, the survey documents were pre-tested in order to identify potential issues and, ultimately, improve the quality of the data collection, the response rate, as well as the validity and reliability of the results (Dillman *et al.*, 2009; Grimm, 2010). As recommended by Fowler (1988) and by Dillman *et al.* (2009), the 12 pre-test participants included not only academics, but also experts in humanitarian logistics since each cohort was expected to focus on different aspects of the questionnaire quality. The pre-test participants were asked to critically review the survey documents. In particular, they were requested to highlight any issues (e.g. lack of clarity, potential bias, spelling and grammatical errors, or format problems), as well as to record their thoughts and/or suggest any alterations. No substantive issues were identified by the pre-test participants as a result of this process, although they suggested a number of minor modifications such as improving the 'signposting' (e.g. providing the number of questions to be asked in the introduction of the questionnaire and adding question numbers) and slightly improving the wording of some questions and instructions to avoid any misunderstanding. The necessary and relevant changes have been made.

The survey was conducted between November 2014 and February 2015 by using the professional licence of the QuestionPro online survey software. In order to protect the confidentiality of the responses and the anonymity of the respondents, a protocol to handle the anonymisation of the data was included in the data collection process.

Conducting this survey online was the most appropriate approach because the potential participants were located around the world. All had, nevertheless, an Internet access, as confirmed by WFP. Additional benefits of conducting the survey online include, among other things, the rapidity of distribution, the ability for participants to respond immediately, the automatic collection of data, and cost effectiveness (Sue and Ritter, 2007).

The survey participants were initially identified by WFP's logistics division. The participants were selected because they hold a university degree and were, therefore, expected to grasp the concepts covered in the survey. In addition, their position, experience and understanding of humanitarian operations were expected to provide the most relevant insights to the research. In order to ensure that the invitation to participate in the survey was not ignored and also as a means of potentially increasing the response rate, it was decided that WFP's logistics division would circulate the questionnaire. The text of the three following emails was provided to WFP:

- Pre-notification email designed to attract the potential participants' attention to the subsequent invitation to participate (an information sheet providing further information on the research was attached to this email)
- Initial invitation email designed to encourage potential respondents to participate in the study (the information sheet providing further information on the research was again attached to this email)
- Follow-up reminder email.

The emails were sent by WFP to some 200 staff members including the logistics management staff as well as the logistics officers working in the central head offices in Rome, in WFP's regional bureaux, or in the field (country-offices, area offices or sub-offices). The script of the online survey can be found in Appendix 3a.

It should be noted that the survey was administered at a time of extreme challenge for the humanitarian community due to an unprecedented level of acute emergencies (as explained in Section 1.1.1). In these conditions, many humanitarians were overworked and it was extremely difficult to achieve a satisfactory level of survey participation (only 28 usable responses were initially received). Delaying the data collection process was considered but, given the high level of complexity and the long-term orientation of the humanitarian crises at the end of 2014 (especially Syria, Iraq, and South Sudan), as well as the possibility of another round of challenges appearing (as was actually the case with the 2015 Nepal earthquake), it was decided to proceed with the survey. However, the online survey was extended to other humanitarian organisations (both other UN agencies and NGOs). To this end, the survey questionnaire was adapted and made agency neutral, i.e. the reference to WFP was removed and replaced by the term 'organisation'. However, the meaning of the questions and statements has, in no case,

been changed. In addition, Section D was removed because the concept of protracted operation is not common in all humanitarian organisations and leaving the questions related to such operations in the questionnaire could have distorted the data collected. The modified survey questionnaire can be found in Appendix 3b.

The recruitment of the new participants was carried out with the support of Michael Whiting from the Forum for Humanitarian and Emergency Logistics Professionals (HELP) of the Chartered Institute of Logistics and Transport in the United Kingdom (CILT UK). Michael Whiting sent 46 invitation emails to potential respondents working for 14 different organisations. At the same time, the survey link was posted on the Humanitarian Logistics Association's LinkedIn discussion group.

Ultimately, 59 usable responses were received. These responses were the primary source of quantitative data for the statistical analysis described in the next section.

3.2.3. Sampling limitations

As a result of the survey design described in the previous section, two sampling limitations influencing the level of generalisability of the quantitative results produced by this research need to be considered. The first limitation relates to this study's limited sample size and the second limitation to the use of non-probability sampling techniques.

As noted by Weiers (2008), statistical inference is the process of deriving the properties of a population from the statistical analysis of observed sample data drawn from this population. A confidence interval and a confidence level are typically computed in order to assess the extent to which the sample size reflects the entire population, i.e. the degree of certainty associated with the statistical estimates drawn from sample data and the resultant possibility to extrapolate the results from the sample to the entire population. In particular, the confidence interval (commonly +/-5%) determines the margin of error involved in the statistical estimates and the confidence level (commonly 95%) measures the probability that the above-mentioned interval contains the true value of the parameter (Lind *et al.*, 2015).

Since, within the framework of this research, the survey participants were neither recruited directly nor within a specific humanitarian organisation, and since an overview of the population of humanitarian logisticians holding a university degree is not available, the population of this research is said to be unknown (or non-finite). It should also be noted that populations of aid workers are highly dynamic since many humanitarians do not hold a permanent contract with a specific organisation but, rather, work on a short-term, mission-based basis. As a result, the number of aid

workers employed by humanitarian organisations constantly evolves on the basis of needs and the number of crises occurring in the world.

A number of authors (e.g. Weiers, 2008) provide the following formula to calculate the required sample size when the size of the population is unknown:

$$n = \frac{z^2 p(1 - p)}{e^2}$$

where:

n = the required sample size

z = the z-value for the desired confidence level

p = the estimated value of the population proportion

e = the maximum margin of error acceptable

Using this formula with a confidence level of 95% (associated Z-score: 1.96) and a confidence interval of 5%, the sample size required to be able to draw conclusions about the population using the sample information is 384 (rounded down to the nearest full percentage point):

$$\frac{1.96^2 (0.5)(1 - 0.5)}{0.05} = 384.16$$

Alternatively, the following equation can be set up to solve for e :

$$e = z \sqrt{\frac{p(1 - p)}{n}}$$

Thus, the confidence interval associated with the actual sample size of this research (59 usable responses) is 13% (rounded to nearest full percentage point):

$$1.96 \sqrt{\frac{(0.5)(1 - 0.5)}{59}} = 12.76$$

On this basis, it can be concluded that the limited sample size of this study is not statistically representative of the population.

In addition to the limitations related to the limited sample size, the sampling techniques used in this research further influence the level of generalisability of the findings. As noted by various authors (e.g. Saunders *et al.*, 2009), sampling can either be random (i.e. probability-based) or non-random (i.e. non-probability based). In non-random sampling, the individuals making up the population do not have equal chances of being included in the sample. According to Pellissier (2007), non-random sampling can be used when the purpose of the research is not to generate generalisable findings.

The sampling techniques used in this study, namely purposive sampling and convenience sampling are non-random. Whilst purposive sampling is based on judgement and the underlying purpose of the study, convenience sampling relies on opportunity and participant accessibility to select potential respondents (Saunders et al., 2009; Robson, 2011).

The sampling of this research was initially purposive since, as mentioned in Section 3.2.2, the survey participants selected were WFP humanitarian logisticians with a university degree, i.e. WFP humanitarian logisticians expected to have a good understanding of the concepts included in the research. However, due to the above-mentioned limited level of survey participation and the subsequent need to recruit respondents beyond WFP, convenience sampling was used by calling on the HELP Forum of CILT UK and by posting the survey link on the Humanitarian Logistics Association's LinkedIn discussion group. Whilst posting the invitation to participate in the survey on LinkedIn supported a broader dissemination of the survey, the associated risk was a loss of participant control since specific respondents could not be targeted for their expected insights in relation to the research. This risk was, however, limited due to the fact that the survey was only posted on the discussion group of the Humanitarian Logistics Association that is a membership association for humanitarian logistics professionals.

As a result of the above-mentioned lack of representativeness of the sample as well as the sampling decisions made in the framework of this research, the conclusions of the quantitative analysis presented in Paper V should not be seen as generalisable to the entire population. That said, the limited size of the sample and its lack of representativeness do not compromise the validity of the results in relation to the sample itself. Thus, as explained in Paper V, the structural equation model tested in this research and presented later in Figure 3.2 contains 10 parameters to be estimated (namely four factor loadings, one path coefficient, and the five error variances of the composite indicators). According to Bentler and Chou (1987) and to Kline (2005), 5-10 cases per estimated parameter constitute an appropriate sample size to test a model by using structural equation modelling, in particular when factor loadings are strong, as is the case in this research. On this basis, the sample size of 59 cases is above the minimum recommended by the above-mentioned authors and is, therefore, adequate.

Given the purpose of this research (investigating the role of organisational capacity building and a number of organisational mechanisms in supporting agility in humanitarian logistics operations), generating sound and robust statistical results in relation to the sample itself is more important than producing generalisable findings that can be extrapolated from the sample to the entire population of humanitarian logisticians with university degrees. More specifically, this research aims to generate

applied knowledge with practical relevance to humanitarian organisations and, to this end, draws on the experience and the individual perceptions of experts in humanitarian logistics. In this respect, the prior use of a best practice case study (i.e. WFP) to collect qualitative data is critical to generate knowledge that transcends its empirical context and to highlight considerations that are of interest and applicable to other organisations (Ketokivi and Choi, 2014).

3.3. Data analysis

This section explains both the qualitative as well as the two quantitative techniques that were used to conduct the data analyses.

3.3.1. Qualitative content analysis

Content analysis is a qualitative technique that enables researchers to examine, make sense, and interpret the content of text data in a systematic manner and in relation to a particular context and frame of reference (Krippendorff, 2004; Hsieh and Shannon, 2005). This technique has been used in three of the papers included in this thesis. In particular, Paper II includes a content analysis of the UN Logistics Cluster's field reports related to the 2011-2012 Somalia operation. The purpose of this content analysis was to illustrate the complexity and dynamism inherent in disaster situations, as well as the significant impact of a disaster's contextual factors on logistics operations. Thus, this content analysis contributes to understand the reasons why agility is needed in humanitarian logistics.

In addition, a content analysis of the 29 interviews conducted at WFP's headquarters was undertaken and reported in Papers IV and VI. In Paper IV, the content analysis aims to corroborate the relevance of the strategic level capabilities (identified in Paper III) to the humanitarian logistics context as well as to confirm that these capabilities contribute to the agility of humanitarian operations. In paper VI, the content analysis is designed to demonstrate that uncertainties and disruptions are an integral part of the supply chain environment of protracted operations and that agility is required in such operations.

Consistent with the deductive approach initially taken in this research, a priori categories established from the existing literature were used to perform the analysis of the interviews' content. The resultant content analysis is, therefore, said to be directed. Hsieh and Shannon (2005) argue that directed content analysis is an appropriate

approach when pre-existing research is used to guide the analysis, but when the phenomenon of interest nevertheless requires further exploration, as is the case of the concept of agility in the framework of this research. Thus, a priori categories were used to establish the coding system required to process the interview data. As observed by Churchill (2013), an appropriate coding system is an essential tool that guides the analysis and enhances the analytical coherence of the text content.

In this study, content analysis provides narrative support to the research and, as a result, more clarity to the knowledge of agility in the context of humanitarian operations. In other words, content analysis supports a deeper and broader understanding of what agility is, and how it is created. However, as explained previously, the qualitative analysis of this study is an essential but not a sufficient step in the research process. In particular, whilst the content analysis reveals an emergent relationship between strategic decision making and agile logistics operations, a shift to quantitative analysis is necessary in order to measure the strength of this relationship.

3.3.2. Structural equation modelling

A structural equation analysis was undertaken in order to quantify the causal relationship between organisational capacity building and the agility of humanitarian logistics operations. This analysis is reported in Paper V. Structural Equation Modelling (SEM) is a statistical method used to test models with latent (non-observed) variables (Byrne, 2010). It also enables researchers to test a set of relationships simultaneously (Hair *et al.*, 2006), and to evaluate structural relationships free of measurement error (Ullman and Bentler, 2004).

SEM is commonly used in the fields of operations management (Shah and Goldstein, 2006) and strategic management (Shook *et al.*, 2004), as well as, to a lesser extent, logistics (Garver and Mentzer, 1999; Wallenburg and Weber, 2005) and supply chain management (Gimenez *et al.*, 2005). The SEM techniques have also been applied in studies exploring supply chain agility in a commercial context (e.g. Vázquez-Bustelo *et al.*, 2007; Gligor and Holcomb, 2012a; Whitten *et al.*, 2012). To date, however, SEM has not been used in the academic literature on humanitarian logistics.

A priori specifications of SEM models typically come from theory and previous research (Kline, 2005). Thus, consistent with the iterative theory development process illustrated in Figure 3.1, the SEM model tested in Paper V and presented in Figure 3.2 was developed by building on the prior research conducted in the framework of this doctoral project. Specifically, the SEM analysis builds on Paper III that develops the conceptual model of agility and identifies the four strategic level capabilities expected to positively influence field agility. In addition, the SEM analysis further develops Paper

IV that identifies an emergent relationship between the four capabilities and operational agility.

In accordance with the symbol notation commonly used in SEM (Hair *et al.*, 2006; Byrne, 2010), the latent variable represented in Figure 3.2 (organisational capacity building) is depicted in an ellipse and the five composite indicators are depicted in rectangles. The composite indicators consist of the aggregation of the individual elements used to measure each of the strategic level capabilities as well as operational agility (see Appendix 3, Sections B and C of the questionnaire). Since a composite score is used to measure the five constructs, the above SEM model is called a single indicator model. Such a model has been developed as a result of the relatively small sample size of this research (59 usable cases, as mentioned in Section 3.2.2). As argued by Bollen (1989) and by Gullo *et al.* (2010), using a single indicator model limits the number of parameters to be estimated and is, therefore, appropriate for limited samples.

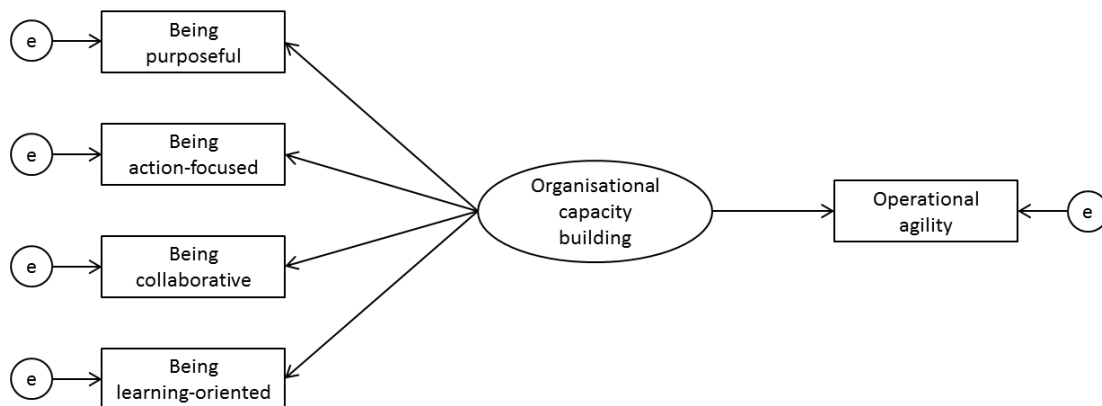


Figure 3.2: SEM model tested in Paper V

Various types of relationships are represented in Figure 3.2:

- The measurement relationships are represented by single-headed arrows leading from the latent variable to the four strategic level capabilities. These relationships are also called factor loadings because they estimate the extent to which the composite indicators are related to the factor (Hair *et al.*, 2006), i.e. organisational capacity building.
- The predictive relationship is represented by a single-headed arrow between the latent variable (i.e. the factor) and operational agility.

In addition to the latent and composite variables, and their relationships, Figure 3.2 depicts errors (in circles). These are measurement errors associated with the composite

variables. They represent both the random errors (or score unreliability, i.e. the degree of variance unexplained by the latent variable) and the systematic errors (i.e. all sources of systematic variance that is not due to the factor, such as the impact of a particular measurement method) (Kline, 2005). It should be noted that, although the measurement errors are usually graphically represented in a SEM model, they are not directly estimated by the statistical analysis. Rather, in accordance with the SEM methodology that is based on (co)variance as the basic statistic, the variance of the errors is estimated (Kline, 2005).

3.3.3. Descriptive statistics

In addition to using statistics to assess relationships, a descriptive analysis of the quantitative data related to protracted operations (Section D of the questionnaire presented in Appendix 3a) was undertaken. This analysis, reported in Paper VI, aims to depict the logistics environment of humanitarian protracted operations in order to gain a more accurate understanding of such operations. As is frequently the case with descriptive statistics, tables and charts are used in Paper VI in order to present the quantitative information gathered. In particular, frequency counts are reported, i.e. the number of times a particular response option has been selected by respondents (Sue and Ritter, 2007). Among other things, these frequency counts describe the following:

- The logistics-related characteristics of protracted operations (e.g. the level of stability of demand patterns, the degree of regularity of deliveries, and the extent to which order fulfilment processes are established),
- The nature and frequency of supply chain-related disruptions encountered in protracted operations (i.e. in relation to demand, supply and processes),
- The nature and frequency of contextual constraints and disruptions encountered in protracted operations (i.e. in relation to the external environment of a disaster situation).

In this regard, the descriptive statistics reported in Paper VI establish a connection between the research on protracted operations and the descriptive/exploratory research conducted in Papers I and II which identify the categories of constraints and disruptions encountered in disaster environments. Table 3.2 summarises the data collection and analysis techniques used in the six papers included in this thesis.

Paper	Nature of the paper	Methodological approach	Data collection	Data analysis
I	Conceptual paper	Qualitative	Literature review	Literature analysis
II	Conceptual/ Research paper	Qualitative	Literature review and field reports	Literature analysis and content analysis of the UN Logistics Cluster's field reports related to the 2011-2012 Somalia operation
III	Conceptual paper	Qualitative	Literature review	Literature analysis
IV	Research paper	Qualitative	WFP interviews	Content analysis
V	Research paper	Quantitative	Survey	Structural equation analysis
VI	Research paper	Qualitative / Quantitative	WFP interviews and WFP survey	Content analysis and descriptive statistics

Table 3.2: Research methods recap

In summary, this chapter presents the combination of qualitative and quantitative research conducted in order to address the research gaps and the research questions presented in Chapter 1, and in order to support the theoretical (deductive and inductive) approaches described in Chapter 2. The results of the qualitative and quantitative studies summarised in Table 3.2 will be presented in the next chapter. Thus, as illustrated below, Chapter 4 will present the key findings of this research as well as their respective contributions.



Figure 3.3: Progress tracker – Moving to Chapter 4

4. PUBLISHED RESULTS

This chapter is concerned with the findings obtained from performing the quantitative and qualitative analyses detailed in the previous chapter. Table 4.1 summarises the key results of, and the messages conveyed in, the six papers reproduced in Chapter 6.

Paper	Aim of the paper in relation to the project	Data collected	Key results and conclusions	Research questions
I	Classifying disaster situations in order to understand the diversity of humanitarian logistics operations	- Literature review	- New analysis framework that differentiates disasters on the basis of their logistics impact - Diversity of humanitarian logistics operations established (among others, emergencies vs. protracted operations)	#1
II	Highlighting the significant level of complexity and dynamism in humanitarian logistics operations	- Literature review - Qualitative data (field reports: 2011-2012 Somalia operation)	- Disaster established as a system made of interconnected elements and entrenched in its external environment - Empirical illustration of the complexity and dynamism inherent in humanitarian logistics operations	#1
III	Shifting the current focus of agility in humanitarian logistics from operational matters to strategic matters	- Literature review	- New model of agility in humanitarian logistics - Identification of a set of four strategic level capabilities supporting agile humanitarian logistics operations	#2 #3
IV	Exploring the underlying strategic mechanisms of agility in humanitarian logistics	- Qualitative data (interviews)	- Empirical confirmation of the relevance of the four strategic level capabilities to the humanitarian context - Empirical confirmation of their role in the building of operational agility - Identification of a set of 14 key strategic decision making areas supporting agility in humanitarian logistics	#2 #3
V	Quantifying the impact of organisational capacity building on operational agility	- Quantitative data (survey)	- 52% of the variance in operational agility accounted for by the four capabilities - Strong standardised factor loading of the four capabilities on organisational capacity building (ranging from .81 and .87) - Demonstration that the four capabilities are closely related to each other and form an integrated whole	#3 #4
VI	Describing the logistics environment of humanitarian protracted operations and investigating the need for agility in such operations	- Qualitative data (interviews) - Quantitative data (survey)	- Differentiation between supply chain-related risks/uncertainties and contextual risks/uncertainties - Supply chain-related constraint most frequently encountered in protracted operations: funding - Contextual constraints/disruptions most frequently encountered in protracted operations: lack of security and lack of transport and communication infrastructures - Empirical demonstration that complexities and dynamics exist and that agility is needed in humanitarian protracted operations	#1 #5

Table 4.1: Key results and conclusions

In the remainder of this chapter, the results reported in each of the papers will be presented, and an in-depth analysis of their contribution will be provided.

4.1. Presentation of the key results

This section presents the findings as well as the main conclusions reported in each paper, and explains how they address the research questions formulated in Chapter 1.

4.1.1. Paper I: ‘A new classification model of disasters based on their logistics implications’

Paper I redefines the boundaries of a disaster from a logistics perspective and, in particular, develops a new classification model for disasters that considers their logistics implications. Thereby, the paper shifts the classification of disasters from the nature of the event (as in the prior literature) to a combination of meaningful characteristics that reflect the logistics impacts of such events. The resulting model integrates two generic dimensions that represent the logistics characteristics of a disaster together with five situational factors that should be considered in addition to the generic characteristics. The two generic dimensions (the time available for action and the geographic scope) create four categories, i.e. emergency vs. protracted disasters, and diffuse vs. localised disasters. It is argued that these categories generate similar logistics requirements. By contrast, the five situational factors (government, socio-economic, infrastructure, environmental, and conflict) reflect the influence of a disaster’s external environment on operations and create unique and complex logistics situations. It is contended that the five situational factors explain most of the operational adjustments that humanitarian organisations need to undertake.

This classification model shows that different disaster situations generate different operational environments and requirements. On this basis, the concept of protracted operation is introduced in Paper I. Whilst the model presents the supply chain environment of protracted disasters as somewhat predictable and stable, it also shows that, even in protracted operations, humanitarian organisations must retain some level of responsiveness and flexibility because the five situational factors affect the design and the complexity of the humanitarian logistics activities.

Thus, Paper I addresses the first research question (*Why is agility needed in humanitarian logistics?*) by showing that field environments are not only diverse but also very complex. In particular, agility is not only needed in response to supply chain-

related risks and uncertainties but also because multiple external factors have a significant impact on logistics operations.

4.1.2. Paper II: ‘Classifying logistics-relevant disasters: conceptual model and empirical illustration’

The logistics-focused classification model for disasters developed in Paper I is further explained and developed in Paper II by taking a theory-based approach. Specifically, the general system theory is used in order to present a disaster as a system made of interconnected elements and entrenched in its external environment. Thus, Paper II demonstrates that a disaster should be considered in its entirety and within its contextual environment. The paper also argues that disasters are made up of intricate and dynamic forces that are impossible to fully predict and control. In particular, the significant impact of the turbulence external to the operating environment (i.e. the macro-environmental turbulence) on logistics operations is emphasised by demonstrating that five situational factors (government, socio-economic, infrastructure, physical, and security) create an extremely high level of instability, complexity, dynamism, and apparent randomness that generate numerous logistics obstacles and impede the continuous flow of humanitarian supplies. Since humanitarian organisations must typically deal with swiftly changing circumstances and uncertainty, they need to constantly adapt their operations in order to deliver the relief supplies when and where they are needed. In other words, they must develop coping mechanisms (i.e. agility) that enable them to protect their logistics operations from disruptive influences.

A number of modifications have been made to the terminology used in Paper I in order to better delineate the situational circumstances of a disaster. Specifically, ‘environmental’ has been renamed ‘physical’ to prevent any confusion in the wording, given that the term ‘environment’ is used to refer to the whole external environment. In addition, ‘conflict’ has been replaced by the more overarching term ‘security’ as a result of the case study analysis which shows that ‘conflict’ is too restrictive and does not cover all the relevant situations encountered in the field.

Paper II also addresses the first research question (*Why is agility needed in humanitarian logistics?*) but, as indicated above, it further develops the concepts and arguments introduced in Paper I by demonstrating that agility is needed in response to a wide range of risks and uncertainties inherent in highly complex and dynamic humanitarian environments. In particular, Paper II’s empirical illustration of the model (i.e. the analysis of the logistics environment of the 2011-2012 Somali operation)

highlights that uncontrollable external factors require humanitarian organisations to constantly adapt and reconfigure their logistics operations.

4.1.3. Paper III: ‘An integrated approach to agility in humanitarian logistics’

Paper III brings new insights into the concept of agility in humanitarian logistics by arguing that limiting the study of agility to operational matters is suboptimal since agility is inherent in strategic decision making and practices. In particular, four strategic level capabilities are identified: (1) being purposeful, (2) being action-focused, (3) being collaborative, and (4) being learning-oriented. Paper III argues that these capabilities support the ability of a humanitarian organisation to respond more rapidly and effectively to the change, uncertainty and disruptions encountered in field operations. In order to achieve them, humanitarian organisations (re)configure and (re)deploy a number of organisational resources and, in particular, people, processes and technology. These latter three sets of resources are called agility enablers in Paper III. Paper III further argues that leaders and managers of humanitarian organisations have the responsibility to develop the four capabilities at all levels of the organisation in order to create an agile system, i.e. to build a supportive environment that enables field workers to conduct responsive and flexible logistics operations.

The above-mentioned elements are integrated into a new conceptual model that presents agility in humanitarian logistics as the adaptive capacity of the whole organisation. Thus, this model embraces an organisational view of the concept and extends its scope beyond the operational perspective adopted to date in the humanitarian logistics literature.

Paper III addresses the second and the third research questions. In regard to the second research question (*Which organisational capabilities are critical to the ability of humanitarian organisations to build and maintain supply chain agility?*), the paper identifies the four strategic level capabilities that support agile supply chain and logistics operations. Paper III also addresses the third research question (*How do humanitarian organisations develop the organisational capabilities required to build and maintain supply chain agility?*) by identifying and exploring the organisational resources/agility enablers that underpin the above-mentioned capabilities.

4.1.4. Paper IV: ‘Developing organisational capabilities to support agility in humanitarian logistics: an exploratory study’

Moving forward from the conceptual framework developed in Paper III, Paper IV empirically examines the four strategic level capabilities (being purposeful, action-focused, collaborative, and learning-oriented) through a qualitative analysis of 29 face-to-face interviews. This analysis confirms that the four capabilities are relevant to the humanitarian context and that they contribute to the agility of humanitarian logistics operations. Going one step further, the paper identifies a set of 14 key strategic level decision making areas that compose and support the four capabilities. This includes, for example, creating and maintaining a clear and value-driven organisational purpose, aligning actions at all levels to the overall purpose, setting up suitable processes and procedures for common operational situations, empowering operational teams, eliminating silos and integrating the different parts of the organisation, developing external relationships, capturing insights from past operational failures and successes, as well as reflecting on past experiences and improving practices accordingly.

Paper IV also demonstrates how these elements enable humanitarian organisations to adapt to uncertain and unstable field environments. Thus, this paper not only explores the strategic level capabilities further, but also explains their underlying structure and how they contribute to producing results, i.e. agility in field operations.

Paper IV addresses the second and third research questions. In relation to the second research question (*Which organisational capabilities are critical to the ability of humanitarian organisations to build and maintain supply chain agility?*), the paper provides additional details on the four strategic level capabilities and, in doing so, gain a more comprehensive understanding of these dimensions in relation to the building of agility. Paper IV also responds to the third research question (*How do humanitarian organisations develop the organisational capabilities required to build and maintain supply chain agility?*) by going into the detail of the text content of each interview and examining the capabilities in greater depth. In particular, Paper IV captures the complexity of the mechanisms underlying each of the four capabilities and identifies a set of key strategic decision making areas that support their development.

4.1.5. Paper V: ‘Investigating the strategic antecedents of agility in humanitarian logistics’

The qualitative research conducted in the previous paper is complemented by the quantitative data analysis undertaken in Paper V. In particular, this paper quantifies the strength of the relationship between the strategic and operational components of agility in humanitarian logistics. To do so, the four strategic level capabilities (being

purposeful, action-focused, collaborative, and learning-oriented) as well as operational agility (field responsiveness and flexibility) are measured. The subsequent statistical analysis reveals that the four capabilities are fundamental building blocks of agility as they collectively account for 52% of the variance in operational agility. In addition, by highlighting the strong factor loadings of the four capabilities on organisational capacity building (standardised factor loadings ranging from .81 to .87), Paper V demonstrates that the four strategic level capabilities form an integrated whole and are mutually reinforcing. On this basis, the paper confirms the multi-dimensional and multi-level nature of agility in humanitarian logistics. In other words, an agile organisation not only exhibits various characteristics (it is purposeful, action-focused, collaborative, and learning-oriented), but also builds agility at all levels of the organisation (i.e. beyond the operational level).

Paper V confirms the relevance of a systemic approach to the concept of agility by demonstrating that agility transcends operational skills and stems from a combination of forces that are closely intertwined and must be developed simultaneously. Thus, agility is not related to isolated practices or a particular capability, but is embedded in an integrated system, the ultimate objective of which is to support the delivery of humanitarian supplies when and where they are needed.

Paper V addresses the third and fourth research questions. In regard to the third research question (*How do humanitarian organisations develop the organisational capabilities required to build and maintain supply chain agility?*), the paper defines the four capabilities at a greater level of detail than in the earlier papers by contributing a list of 40 specific decision making areas that can be used and operationalised to develop the four strategic level capabilities. Through empirically and quantitatively assessing the impact of organisational capacity building on operational agility, Paper V also addresses the fourth research question (*To what extent does organisational capacity building impact on operational agility in the humanitarian logistics context?*) and, thereby, fulfils its core purpose.

4.1.6. Paper VI: 'Supply chain agility in humanitarian protracted operations'

Having examined both the components of agility and the interrelations among these components in the previous papers, Paper VI demonstrates that agility is an important requirement not only in emergencies, but also in humanitarian protracted operations. Although such operations are characterised by non-urgent action and by the availability of reasonably long lead times that reflect the need for assistance in the future or on a regular basis, protracted operations are not free of uncertainties and disruptions.

Thus, Paper VI categorises the risks and uncertainties that negatively impact on humanitarian logistics operations (i.e. risks and uncertainties in relation to supply, processes, demand, as well as the macro-environment) and considers these elements in the context of protracted operations. The analyses of the interview text content and of the survey data show that supply, demand and process risks and uncertainties are limited in protracted operations, and this supports a certain level of stability and continuity in the supply chain environment. However, not only do funding constraints continue to exist, but also multiple obstacles and disruptions are generated by the macro-environment (e.g. security issues, lack of infrastructure, inefficient administration, and/or corrupt practices). In order to mitigate or overcome these challenges and support a continuous and timely flow of deliveries, the achievement of supply chain agility is essential in protracted operations.

Paper VI addresses the first and the fifth research questions. In relation to the first research question (*Why is agility needed in humanitarian logistics?*), the paper provides a clear explanation and a categorisation of the various risks/uncertainties that can disrupt the continuity of the humanitarian logistics and supply chain flows. Paper VI also responds to the fifth research question (*Are agile practices required in humanitarian protracted operations?*) by demonstrating that although the operating environment of protracted operations is reasonably stable, contingencies remain an integral part of such operations, not least due to the negative influence of externalities. Therefore, agility is essential in order to respond rapidly and effectively to these uncertain and/or disruptive events.

4.2. Contributions of the research

After having presented the research findings in Section 4.1, this section explains how this study makes a contribution to knowledge by building a case for looking at the concept of agility in humanitarian logistics through a different lens from that previously found in the literature. In particular, this section focuses on the extension of the scope of agility beyond operational expertise and beyond emergency operations. Thus, on the basis of the results presented in the previous section, and as further explained below, the key contributions of this study are as follows:

1. The focus of agility in humanitarian logistics is moved from operational to strategic matters,
2. Four strategic level capabilities that support supply chain agility in field operations are identified and tested empirically,

3. A set of practices that enhance the four strategic level capabilities is developed,
4. The risks and uncertainties encountered in humanitarian logistics operations are identified and categorised,
5. Agility is established as an essential requirement in protracted operations.

Figure 4.1 illustrates how the five above-mentioned contributions fill the three research gaps identified in Section 1.2. This will be further explained in the sections that follow.

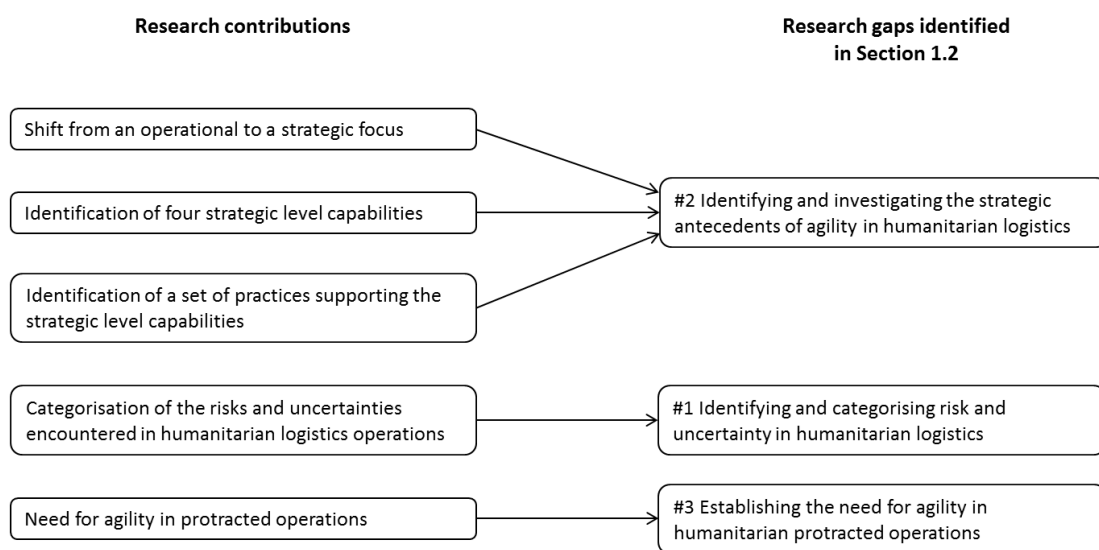


Figure 4.1: Filling the research gaps

4.2.1. Moving from an operational to a strategic focus

This study's first contribution is to demonstrate that the ability to overcome field contingencies and to deliver the right humanitarian supplies at the right time and to the right place depends on more than operational expertise and creative solutions in the field. Agility is supported by the provision of multiple inputs that include recruitment, information systems, organisational structure, the allocation of decision-making authority, the way people relate to each other, cross-organisational relationships, etc. As a consequence, this research highlights the crucial role of leadership in setting the right conditions for agile operations, i.e. in building and maintaining an agile environment that enables field logisticians to deal with the multiple challenges and obstacles inherent in humanitarian operations. In doing so, this study moves the focus of agility in humanitarian logistics from being primarily related to operational matters to predominantly strategic considerations. In other words, agility is not only considered

as an operational outcome (the ability to deal with contingencies), but first and foremost as the adaptive capacity of an organisation as a whole that supports and facilitates this operational outcome.

Such an extended view of the concept of agility has not been taken in the prior humanitarian logistics literature which often associates agility with short-term issue resolution, reactive adjustments, and/or firefighting measures. Whilst this limited approach to agility enables, to some extent, humanitarians to adjust to disruptive occurrences, it does not support proactivity and does not enable a humanitarian organisation to move smoothly from one operation to another. By contrast, organisational agility originates from the organisation's internal behaviour and supports more lasting solutions.

As a consequence, this research contributes to filling the second research gap identified in Section 1.2.2, i.e. that related to the need to go beyond technical and operational expertise to achieve agility. This wider scope results from the systems approach taken throughout the whole research project. Figure 4.2, which reflects the system levels presented earlier in Section 2.1.1, illustrates this change of perspective.

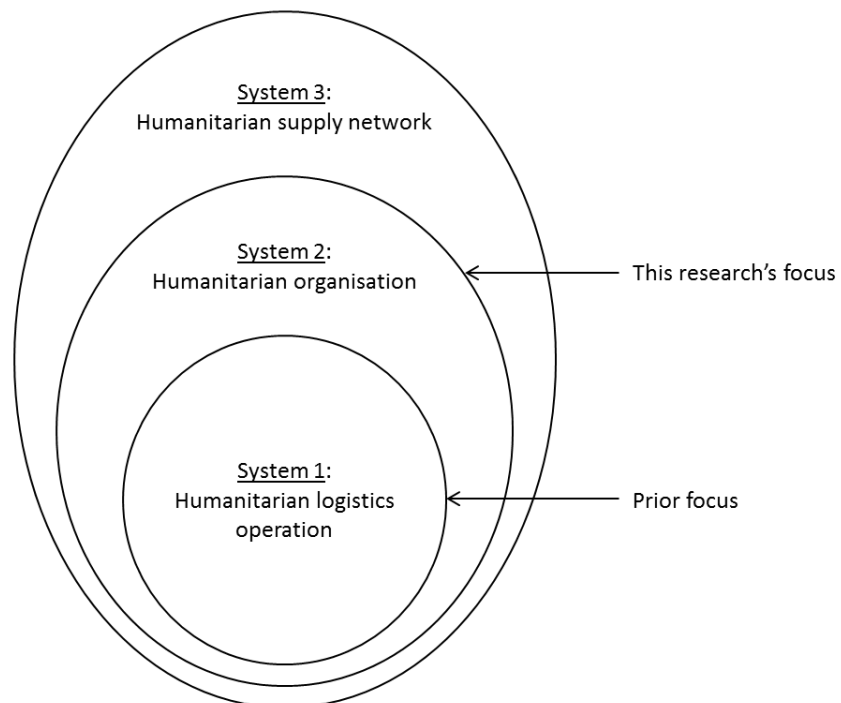


Figure 4.2: Moving the focus of agility to a higher system level

In particular, Figure 4.2 shows that the focus of agility in humanitarian logistics has moved to a higher system level, i.e. from the level of humanitarian logistics operations to the level of the humanitarian organisation. As a consequence, this research does not restrict the concept of agility to the ability to fix immediate problems at the operational level. Rather, it sees agility as an institutionalised adaptive capacity that enables a humanitarian organisation not only to deal with the issue at hand, but also to be proactive and to maintain a sustained level of performance when moving from one turbulent environment to another (i.e. from one operation to another).

4.2.2. Identifying the strategic level agility capabilities

Consistent with the research's systems approach to agility, this study establishes that an agile organisation is a system made up of a number of elements and interconnections. Thus, in order to fully understand how agility is created, this research identifies both the system elements themselves, and how they relate to each other. In this regard, this study's second contribution is to identify a set of four strategic level capabilities (i.e. being purposeful, being action-focused, being collaborative, and being learning-oriented) that enable a humanitarian organisation to be proactive in the management of change, uncertainty and disruptions. These four capabilities are empirically tested and it is demonstrated that they have a significant impact on responsiveness and flexibility in field operations, and that they are closely intertwined.

Since the humanitarian logistics literature contains only brief discussions on the strategic antecedents of operational agility, this work further fills the second research gap identified in Section 1.2.2. Its significance lies in the demonstration that being agile requires that leaders of humanitarian organisations focus on the concurrent development of the four above-mentioned strategic level capabilities. In doing so, leaders of humanitarian organisations will develop the internal adaptive and, indeed, proactive capacity of their organisations, rather than just ensuring that field workers are operationally reactive. The role of leaders of humanitarian organisations is further developed in the next chapter that, among other things, focuses on the implications of the research.

4.2.3. Developing a set of practices supporting the strategic level capabilities

In order to further address the second research gap identified in Section 1.2.2 and, thereby, provide a complete picture of what should be done at the strategic level of a humanitarian organisation in order to support responsive and flexible humanitarian logistics operations, this research investigates the mechanisms underlying the four

strategic level capabilities. In particular, 40 decision making areas that leaders of humanitarian organisations can consider in order to turn their organisation into a purposeful, action-focused, collaborative, and learning-oriented organisation have been identified. The list of these 40 elements, presented in Appendix 4, constitutes this research's third contribution.

Consistent with the multi-level approach underpinning the whole of this research, these practices have been developed at four different organisational levels, i.e. at the (1) individual, (2) team, (3) strategic, and (4) supply network levels. This not only ensures a comprehensive coverage of the four capabilities, but also reflects the fact that agility needs to be developed in all organisational directions, i.e. upwards, downwards and around.

Identifying the 40 above-mentioned decision making areas is essential in order to provide the basis for a clear line of action and, therefore, make this research prescriptive. In other words, this study explains how humanitarian organisations can develop the strategic level capabilities in order to better adapt to the many constraints and disruptions inherent in humanitarian operations, and to better adjust to shifting disaster environments, i.e. to move effectively from one operation to another.

4.2.4. Going beyond supply chain-related risks and uncertainties: the significance of a disaster's external environment

In addition to understanding how humanitarian organisations can develop an internal adaptive capacity, this research explores why doing so is essential and, thereby, identifies what drives the need for agility in humanitarian logistics operations. This constitutes the study's fourth contribution. Thus, for the first time in the humanitarian logistics literature, the risks and uncertainties inherent in humanitarian logistics operations are categorised, and the macro-environment of disaster situations is recognised as an essential agility driver beyond demand shifts, supply unpredictability, and unreliable logistics and supply chain processes. This shows that humanitarian organisations are open systems, i.e. they are part of an environmental context that cannot be ignored, in particular when studying the concept of supply chain agility.

Thus, this research fills the first research gap identified in Section 1.2.1, i.e. that related to the need to understand the reasons why agility is needed in humanitarian logistics. Doing so enables a clear distinction to be made between the humanitarian and the commercial logistics environments. Thus, in humanitarian environments, agility is not only a mechanism in response to the main risks and uncertainties encountered in business logistics and supply chain operations, i.e. the risks and uncertainties related to supply (e.g. supplier failure), demand (e.g. lack of demand visibility), and processes (e.g.

inadequate delivery procedures), but also in response to macro-environmental complexities and dynamics that create unique circumstances in each operation.

Going one step further, this research highlights that business principles (such as supply chain agility) can only be applied to the humanitarian logistics discipline after they have been adapted to take the unique characteristics of the humanitarian environment into consideration. By fully understanding as well as taking into account the specific environment in which humanitarian organisations operate, future research will be better placed to respond to their needs and to provide tools and solutions that are more clearly adapted to real-life circumstances and are, therefore, of greater utility and value to practitioners.

4.2.5. Going beyond emergencies: the need for agility in protracted operations

The fifth contribution of this research relates to the concept of agility in the framework of humanitarian protracted operations. Thus, further extending the study of agility in humanitarian logistics, this research provides a better understanding of the logistics environment of such operations and, on this basis, demonstrates that agility is an essential requirement in humanitarian protracted operations. This contributes to addressing the third research gap identified in Section 1.2.3, i.e. in relation to the fact that the current humanitarian logistics literature mainly associates agility with emergency operations. In doing so, this research also contributes to mitigating a broader limitation in the humanitarian logistics discipline, i.e. the primary focus of the current literature on emergencies and the resultant limited number of discussions on protracted operations.

In addition, this research emphasises the fact that the humanitarian work goes beyond the emergency phase of a disaster and, by considering the logistics features of humanitarian protracted operations, pave the way for the development of adapted tools and solutions that will respond to the actual needs of practitioners in longer-term operations. In a similar way to the above discussion in relation to the nature of the risks and uncertainties encountered in field operations, understanding the nature of the various operations conducted by humanitarian organisations is essential in order to develop appropriate and usable tools and solutions for each type of operation.

In summary, this chapter presents the key findings of this research and explains how they make a significant contribution to the research on agility in the humanitarian logistics context. Going one step further, this chapter explains how the results of this study contribute to addressing each of the research questions and to filling each of the research gaps identified in Chapter 1. The above findings and contributions will be considered in greater detail in the next chapter of this thesis which, as illustrated

below, will focus on discussing the research results by considering their implications for research, theory and practice, by identifying their limitations, and by providing recommendations for future investigations.

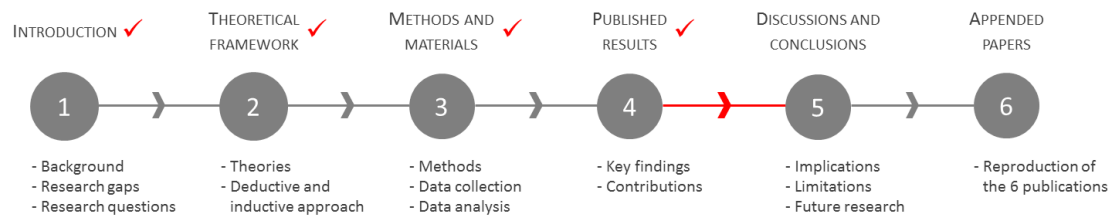


Figure 4.3: Progress tracker – Moving to Chapter 5

5. DISCUSSIONS AND CONCLUSIONS

The aim of this chapter is to discuss the results presented in Chapter 4 and, in particular, to reflect on the implications of these results not only for research and from a theoretical perspective, but also for practice. This chapter also draws attention to a number of research constraints and limitations, and suggests areas of future research in order to further develop and deepen the analysis of agility in the humanitarian logistics context.

5.1. Implications of the research

The implications of the findings presented in the previous chapter are three-fold and relate to (1) research in the humanitarian logistics discipline, (2) the development of the foundations of a novel theory, and (3) the significant role that the leaders and managers of humanitarian organisations need to play in order to build and maintain an agile system.

5.1.1. Implications for research in humanitarian logistics

This research makes a substantial contribution to the humanitarian logistics discipline, not least because it is the first comprehensive study that takes a multi-level approach to the concept of agility in humanitarian logistics. It demonstrates that field responsiveness and flexibility are more than operational characteristics, i.e. that agility needs to be built into the organisation and that it results from core organisational capabilities. The clear academic implication of this is that new areas of research are opened. In particular, this study emphasises the need for academics to move the research on agility in humanitarian logistics from a narrow focus on immediate action to a broader one that considers the organisational mechanisms as well as the dynamics that support the ability to take immediate action.

This research also extends the concept of agility beyond emergency operations by demonstrating that, unlike what has been typically assumed, agility is an essential requirement in protracted operations. It is, therefore, argued that researchers should not limit agility studies to short-term responses and to sudden emergencies, but should expand the scope of their analyses into the recovery phase of a disaster and into longer-term operations. Doing so is all the more important as, in practice, humanitarian assistance and resources are overwhelmingly directed to long-running operations

(Bennett, 2015). Therefore, researchers should recognise and address the specific needs of humanitarian organisations involved in protracted operations and in long-term development programmes.

In addition, by drawing on prior research conducted in a business context, this study demonstrates that business principles are transferable to the humanitarian environment, and that researchers who choose such an approach have the potential to improve humanitarian logistics and supply chain operations. In any case, as noted by Taylor and Pettit (2009) and as confirmed by this study, applying business principles to the humanitarian context requires that researchers take into account the specific environment in which humanitarian organisations operate.

5.1.2. Theoretical implications

In addition to the above-mentioned implications for research, this study develops new theoretical insights. In particular, it uses prior literature, existing theories and empirical evidence as the basis for developing the foundations of the theory of organisational agility in humanitarian logistics. As discussed by Jahre *et al.* (2009) and by Dijkzeul *et al.* (2013), theory building approaches that promote further research and, at the same time, inform practice are limited and, therefore, require more thorough consideration in humanitarian research. Going one step further, Tabaklar *et al.* (2015) note that the humanitarian logistics literature can benefit from borrowing theories from other disciplines. This is what was done in this research project.

Thus, following Eisenhardt's (1989) recommendation, theories and prior literature were initially used in order to specify the constructs and, therefore, shape the design of the newly developed theory. In particular, this research drew on Teece's dynamic capabilities model and on the literature on agility in the manufacturing, strategic management and software development disciplines in order to identify and develop the four strategic level capabilities (being purposeful, action-focused, collaborative, and learning-oriented) that were expected to enhance responsive and flexible humanitarian logistics operations. The resultant emergent theory was subsequently adapted to the humanitarian context and tested by collecting and analysing qualitative and quantitative data, and by providing empirical evidence that the four above-mentioned strategic level capabilities play a significant role in the building of agility in humanitarian logistics.

Thus, this research forms the foundations for a novel theory in the humanitarian logistics discipline, i.e. for the theory of organisational agility in humanitarian logistics. The general statement of this theory is as follows: organisational capacity building (that

encompasses the four above-mentioned capabilities) increases the agility of humanitarian logistics operations, i.e. field responsiveness and flexibility. As emphasised by Eisenhardt (1989), a good theory is both parsimonious and broad enough to be generalisable. It is argued that the general statement and constructs of the theory of organisational agility in humanitarian logistics are sufficiently broad to be adapted to different types of organisations. However, since it has been repeatedly argued that humanitarian organisations do not form a homogeneous whole (Long and Wood, 1995; Kovács and Spens, 2007), it is important to ensure that this theory is, indeed, applicable across organisations, i.e. whatever their size, purpose, scope of intervention, and operating modes. This point will be further developed in Section 5.3 that focuses on recommending avenues for future research.

The theory of organisational agility in humanitarian logistics makes clear references to the dynamic capabilities model. Two of these references are now explained. First, in the same way that Teece's dynamic capabilities model goes beyond technical fitness and embraces the concept of external fitness, i.e. the ability to fit the requirements of an unstable and ever-changing business ecosystem (Teece, 2009), the newly developed theory points out that humanitarian organisations should not only excel operationally, but should also be able to adapt to changing situations and circumstances. O'Reilly and Tushman (2008) call such organisations 'ambidextrous'. Thus, logistics expertise (for example in warehousing, fleet management or shipping) is important but not sufficient, and should be supplemented by the ability of humanitarian organisations to respond and adapt swiftly to disruptive events and to changes. Since ambidextrous organisations are also able to adjust rapidly to environments with different operational focuses (O'Reilly and Tushman, 2008), agility is not only needed to adapt to short-term, field level changes within the framework of a particular humanitarian operation, but also to shift easily from one operation to another. This includes shifting between operations in different countries, as well as between operations with different levels of urgency (e.g. moving from an emergency operation to a protracted operation).

Second, in the same way that Teece's model requires leaders to be able to (re)combine, (re)deploy and (re)configure a number of resources, including assets, skills, processes, procedures and structures (Teece, 2009), the role of the leaders of humanitarian organisations is to be facilitators and orchestrators by ensuring that agility is deeply embedded in the way the organisation operates and in its resources. The term 'resources' should be understood broadly, i.e. it reflects Teece's micro-foundations mentioned in section 2.2.2 (called agility enablers in this study). Resources/agility enablers include people, processes and technology. It follows that an agile humanitarian organisation is able to constantly (re)combine, (re)deploy and (re)configure these agility enablers in order to achieve the four agility capabilities and,

ultimately, to support field logistics operations and enhance process continuity and operational effectiveness (i.e. delivering the right supplies to the right place and at the right time).

5.1.3. Implications for humanitarian organisations

In addition to having relevance to academics, this research informs the thinking, decisions and actions of practitioners. In particular, it raises awareness of the essential role played by the strategic level of a humanitarian organisation in building operational agility. This leadership role involves providing a clear direction and building the system that supports the operational level by removing the organisational obstacles that prevent field logisticians from delivering results. Not doing so, in effect, leaves field workers without the appropriate organisational support and, therefore, compels them to continuously find ad hoc solutions in order to cope with field turbulence. In other words, without leadership support, agility remains at the operational level (see system levels in Figure 4.2). As a consequence, leaders have the responsibility both for elevating agility to the organisational level and for developing the four strategic level capabilities that will make their organisations purposeful, action-focused, collaborative and learning-oriented.

Thus, in order to develop a purposeful organisation, leaders need to define a strong and clear purpose, and ensure that this purpose is well understood at all levels of the organisation and also provides the perspective against which the required decisions and actions are taken. In other words, leaders should develop a value-driven agenda that shapes decision-making and guides action in all circumstances, including in turbulent and uncertain environments. In order to make the organisation action-focused, leaders need to ensure that the tools supporting action in the field are available. This includes the decentralisation of decision making, the provision of the necessary skills and expertise as well as an adequate level of resources, the development of appropriate processes and procedures, effective leadership, and easy access to the necessary information. In order to develop the third strategic level capability, i.e. being collaborative, leaders of humanitarian organisations should facilitate intra-organisational as well as inter-organisational communication, coordination, and collaboration. Finally, leaders can make their organisations learning-oriented by elevating learning at a strategic level and developing systems that promote learning throughout the whole organisation, i.e. at the individual, team and corporate levels, as well as outside the organisation. In particular, leaders should support the development of a system that identifies best practices and facilitates their sharing

across operations and, in doing so, enables field workers to use methods or techniques already tried and successfully tested in the field.

In addition to highlighting the role of leaders of humanitarian organisations in the development of the four above-mentioned capabilities, this study emphasises that these capabilities form an integrated whole and, should, therefore, be developed concurrently. For example, the first strategic level capability (being purposeful) complements the second one (being action-focused) because action needs a purpose. As a consequence, leaders need to gain a good understanding of the connections among the various components of agility, and be fully aware that focusing on one capability without developing the others is suboptimal.

In order to facilitate this understanding, this study provides the basis for a practical approach in the form of 40 elements (see Appendix 4) that can be used to support leaders' decision making and operationalised to develop the four strategic level capabilities. It is recommended that leaders of humanitarian organisations employ this framework as a guiding tool. They can, in particular, consider the 40 individual elements in order to diagnose and develop their organisation's agility. This involves the following steps:

1. Identifying those individual elements that are the most relevant to create and sustain agility within a particular organisation,
2. Using these elements to evaluate the level of achievement of each of the four capabilities,
3. Identifying the gaps and areas for improvement,
4. Determining what the central offices of the organisation can do better to support field work,
5. Developing plans and deciding on the actions to be taken in order to fill or mitigate the gaps.

The 40 elements listed in Appendix 4 make it clear that, in the absence of a solid understanding of what is happening in the field, leaders of humanitarian organisations will not be able to support logistics operations adequately. Therefore, they need to be aware of the challenges that logisticians face when trying to maintain continuity in the humanitarian deliveries and of the resources needed in the field to overcome these challenges.

The creation of agility requires not only an explicit approach and the commitment of the strategic level of the organisation, but also deliberate investments (O'Reilly and Tushman, 2008) in people, structure and technology, and beyond these tools, a change in the organisational culture and in attitudes (James, 2008; O'Reilly and Tushman,

2008). As a consequence, leaders of humanitarian organisations should be aware that creating agility is a slow process that must be developed and refined over time (Doz and Kosonen, 2008a).

It follows from the above discussions that the logistics function should not be solely focused on operational issues, but be embedded in the business model of humanitarian organisations. Since focusing problem solving and agility on the logistics function is suboptimal, logistics needs to be seen not only as a core operational competence, but also as one needed to achieve a higher purpose. Thus, leaders of humanitarian organisations have the responsibility for moving the role of logistics from a primarily transactional function to a value-adding one that is aligned with the organisational strategy. In doing so, leaders will also move the movement of goods from a pure logistics perspective involving mainly transport and inventory management to a broader and strategic level perspective based on integrated planning and execution.

5.2. Constraints and limitations of the research

The constraints and limitations of the research have been identified in each of the individual papers that form this thesis. Nevertheless, in relation to the research as a whole, two constraints and limitations should be mentioned. Firstly, the collection of quantitative data for this research coincided with an unprecedented level of activity and complexity for the humanitarian community due to the simultaneous occurrence of five acute crises (see Section 1.1.1). As a result of these difficult conditions, the level of response to the survey circulated among WFP's logistics experts was low and this prompted an alternative data collection strategy, namely the extension of the online survey to other humanitarian organisations. It was, therefore, impossible to focus the whole research on a single best practice case study, i.e. WFP, as initially planned.

WFP has, nevertheless been significantly involved in this research and, in particular, in the collection of the qualitative data, the investigation of the strategic underlying mechanisms of agility in the humanitarian logistics context, and the design of the survey questionnaire. The resultant second limitation of this research is that it is mainly directed towards international humanitarian organisations. Its application to other organisations has not been investigated. Whilst, as suggested in Section 5.1.2, the four strategic level capabilities (being purposeful, action-focused, collaborative, and learning-oriented) are likely to apply to all types of humanitarian organisations, some of the 40 individual elements associated with these capabilities (see Appendix 4) may not be fully relevant to smaller and/or local humanitarian actors. Examples include those

requiring structural investments such as an extensive field presence with offices in remote areas, or the availability of a sophisticated, IT-based logistics management information system.

Given that this research may not be entirely applicable to all types of humanitarian organisations, the theory of organisational agility that emerges in this study cannot be considered as fully generalisable. In other words, the extent to which this research and, in particular, the 40 individual elements associated with the capabilities fully, or only partially, apply to different types of organisations (e.g. small/big, local/regional/international, governmental/ non-governmental, faith-based/secular, etc.) remains to be established in order to draw generalisable inferences.

That said, the study of the concept of agility in humanitarian logistics is still at its early stage and, as a consequence, the above-mentioned limitations are opportunities for future research, as expounded in the next section.

5.3. Recommendations for future research

This research builds a foundation for future research work. Critically, as mentioned in the previous section, this includes considering the concept of agility across a variety of organisations. In this respect, it should be noted that conducting a cross-case analysis may be a challenging exercise since humanitarian organisations are very different from each other and operate in highly diverse disaster environments. In these circumstances, establishing comparisons may be difficult. A cross-case analysis is, nevertheless, important because the nature and the degree of agility required almost certainly differs from organisation to organisation, and because the mechanisms to achieve agility are also likely to vary from one organisational setting to another. In particular, the 40 leadership actions supporting the development of the four strategic level capabilities (see Appendix 4) need to be further considered in order to determine the extent to which these actions are applicable to all types of organisations and, in particular, to smaller and medium-sized organisations. Doing so will, ultimately, enable researchers to develop an agenda that is adapted to the different types and sizes of humanitarian organisations.

That being said, in their paper on dynamic capabilities, Eisenhardt and Martin (2000) argue that shared features and common best practices can be identified even though the details of the capabilities and the ways to achieve them are unique to each organisation. Therefore, commonalities across different types of humanitarian

organisations should be identified. Doing so will enable researchers to validate and/or refine the findings of this study, to derive general propositions across a number of organisations (Yin, 2003; Simons, 2009) and, ultimately, to produce context-independent knowledge (Flyvbjerg, 2006) and build a generalisable theory based on multiple empirical theory-testing and theory-refining analyses (Eisenhardt, 1989). In summary, future studies might consider the following research questions (RQs):

- RQ1. How does the need for, and the building of, agility vary across organisations?
- RQ2. Notwithstanding their differences, what are the common approaches to agility exhibited by humanitarian organisations?

The potential for future research also includes translating the four strategic level capabilities into operating reality. In other words, a leadership agenda that is based on a set of practical and actionable steps for the implementation of this academic research should be developed. Such an implementation guide is essential in order to help practitioners make better sense of this research, and to assist leaders in driving the necessary changes and developing purposeful, action-focused, collaborative and learning-oriented humanitarian organisations. In doing so, researchers could further investigate the role of the agility enablers (people, processes and technology) in the development of the four strategic level capabilities. In particular, a deeper knowledge of how these resources contribute to the creation of agility, the extent to which they form an integrated whole, and how they can be combined in order to enhance the agility of humanitarian logistics operations is still needed. Thus, the following research questions remain to be addressed:

- RQ3. What are the practical steps involved in the development of the strategic level capabilities?
- RQ4. How do agility enablers (people, processes and technology) support agile humanitarian logistics operations?

In addition, it is important to note that agility should not be seen as an end in itself. Rather, agility is a means to an end, i.e. it helps humanitarian organisations overcome disruptions, it prevents these disruptions from negatively impacting on delivery performance, and it enables the right humanitarian items to be delivered to the right place, at the right time, in the right quantities, in the right condition, and at the right cost. Agility also assists humanitarian organisations in maintaining a certain level of delivery and cost performance while shifting across operations. In other words, it is argued that agility supports the effectiveness and efficiency of humanitarian logistics operations.

In the current humanitarian logistics literature, agility is closely associated with effectiveness (Cozzolino *et al.*, 2012) and is not considered as an antecedent to efficiency. However, studies on business logistics performance have found that logistics efficiency and logistics effectiveness are not mutually exclusive (Fugate *et al.*, 2010). In addition, as contented by Mentzer and Konrad (1991), any analysis of logistics performance should consider both efficiency (that measures resource utilisation) and effectiveness (that measures goal achievement). This idea is all the more relevant to the humanitarian context as humanitarian organisations pursue two main objectives, i.e. fulfilling their mission (saving life/alleviating human suffering) as well as achieving financial sustainability in the context of the limited availability of funding. Therefore, they must provide high-value services (effectiveness) while minimising logistics costs as much as possible (efficiency) (Beamon and Balcik, 2008).

Thus, in light of emerging research that considers the performance outcomes of supply chain agility in terms of both effectiveness and efficiency (Gligor *et al.*, 2015), further investigation is called for to assess the impact of agility as studied in this research on both the effectiveness and the efficiency of humanitarian logistics operations. In other words, the following research questions deserve further investigation:

- RQ5. What is the impact of agility on the effectiveness of humanitarian logistics operations?
- RQ6. What is the impact of agility on the efficiency of humanitarian logistics operations?

Further research should also be undertaken in relation to protracted operations. Whilst this study identifies their basic logistics features, highlights that unpredictability is present in the operational environment of such operations and, on this basis, demonstrates that agile practices are required, it does not develop practical and actionable prescriptions in respect of protracted operations. It also does not make any comparisons across different operational environments and, in particular, across emergencies, protracted operations and development programmes. Such comparative studies would enable researchers to develop specific recommendations and analytical models fully adapted to each type of operation. As a consequence, future research should address the following research questions:

- RQ7. What general logistics and supply chain practices and strategies should be implemented in protracted operations?
- RQ8. How does the logistics environment of protracted operations differ from emergencies and development programmes?

5.4. Final observations

This study adds to a growing body of research investigating the strategic antecedents of supply chain agility (e.g. Braunscheidel and Suresh, 2009; Gligor and Holcomb, 2012a; Gligor, 2013) but, in contrast to these prior analyses which study commercial supply chains, this research focuses on the humanitarian environment. It redefines the boundaries of the concept of agility in the humanitarian logistics context and opens up new perspectives on the ways to increase the responsiveness and flexibility of field operations. Doing so is all the more important as, despite the progress made by humanitarian organisations in terms of skill development, professionalisation, and coordination, fundamental organisational transformations remain needed in the humanitarian sector (Barnett and Walker, 2015). In addition, in the context of increasing humanitarian complexity, a growing number of long-term, recurrent and severe crises, rising demand for humanitarian assistance, and the limited funding available (Carpenter and Bennett, 2015; Redvers, 2015), humanitarian organisations are confronted with problems that are extremely difficult to solve. As a consequence, it is more necessary than ever that the leaders of such organisations reappraise the way they operate and that they embrace the necessary changes.

Thus, this research broadens the concept of agility in the humanitarian logistics context, and highlights that responsive and flexible operations transcend the logistics function and depend on structural mechanisms, i.e. on the development of four deep-rooted organisational capabilities. Fink *et al.* (2014) provide a real-life illustration of these mechanisms. In particular, they emphasise the role of a clear mandate, delegated decision-making, cooperation between the field and the headquarters, and a culture of continuous improvement in the ability of Médecins Sans Frontières (MSF) to build agility and respond to the Ebola outbreak in West Africa. The above-mentioned elements clearly enabled MSF to swiftly set up treatment centres in West Africa and to adjust the protective gear and the medical equipment in order to meet the specific needs of the Ebola crisis.

In addition to establishing that agility requires a systems approach as well as deep-rooted transformations that transcend one operation or function, this research demonstrates that agility goes beyond emergencies and is an essential requirement in protracted operations. As a consequence, the work presented in this thesis builds a compelling foundation for changing the way academics and practitioners think about the concept of agility in the context of humanitarian operations. In doing so, this study opens up new perspectives on ways to improve humanitarian practice and, in particular, preparedness and response activities. Therefore, it makes a significant contribution to the humanitarian logistics discipline and to the research on agility in the humanitarian logistics context.

Chapters 1 to 5 were designed to demonstrate that the papers included in this thesis constitute essential parts of a coherent and integrated whole, and that they contribute to the overall research work. As illustrated, below, the final chapter reproduces the six papers contained in this thesis.

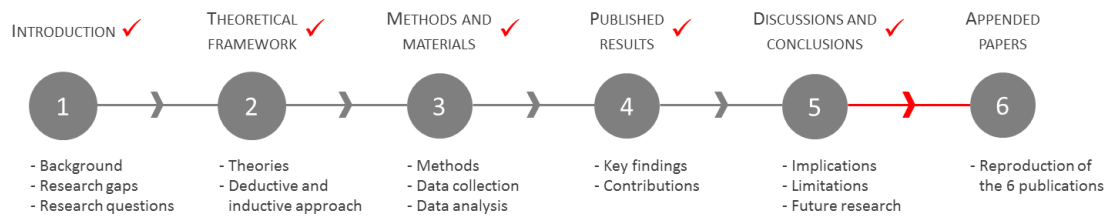


Figure 5.1: Progress tracker – Moving to Chapter 6

6. APPENDED PAPERS

Chapter 6 reproduces the manuscripts published or submitted in the framework of the doctoral project. The six papers have not been rewritten for this thesis. There are, therefore, unavoidable repetitions, especially among the papers as well as between the papers and the thesis chapters. However, in order to ensure the consistency of format, the six papers have been reformatted and the references have been included in the unique list of references at the end of this thesis. With a view to better differentiating the actual papers from the remainder of the thesis, a different format (font, font-size, etc.) has been used for the overall presentation of the papers, i.e. for the headlines, the content, the illustrations, etc.

Table 6.1 recaps the characteristics of the papers reproduced in the remainder of this chapter.

Paper	Nature	Title	Publication channel	Full-length, double blind review	Status
I	Conceptual	A new classification model of disasters based on their logistics implications	11th ANZAM Operations, Supply Chain and Services Management Symposium, Brisbane, Australia	Yes	Published (2013)
II	Conceptual/ Research	Classifying logistics-relevant disasters: conceptual model and empirical illustration	<i>Journal of Humanitarian Logistics and Supply Chain Management</i>	Yes	Published (2014)
III	Conceptual	An integrated approach to agility in humanitarian logistics	<i>Journal of Humanitarian Logistics and Supply Chain Management</i>	Yes	Published (2015)
IV	Research	Developing organisational capabilities to support agility in humanitarian logistics: an exploratory study	<i>Journal of Humanitarian Logistics and Supply Chain Management</i>	Yes	Published (2016)
V	Research	Investigating the strategic antecedents of agility in humanitarian logistics	<i>Disasters</i>	Yes	Accepted for publication
VI	Research	Supply chain agility in humanitarian protracted operations	<i>Journal of Humanitarian Logistics and Supply Chain Management</i>	Yes	Accepted for publication

Table 6.1: Publication recap

It should be noted that Paper I and Paper II are closely related to each other since Paper II is a journal paper following on from Paper I, a conference paper¹. Thus, the two papers are complementary with an integrated focus on the development of a new classification model for disasters based on their logistics implications. In particular, Paper I conceptualises the classification model by drawing on prior literature and, especially, on that related to disasters. Paper II provides the theoretical underpinnings and additional details supporting the construction of the model. The paper also contextualises the model by applying it to a particular case study (the 2011-2012 Somali food crisis). From that perspective, the conference paper and the journal paper are different, but complementary and both papers have, therefore, been included in this thesis.

¹ This paper was awarded the 'best student paper' prize at the 11th Australian and New Zealand Academy of Management (ANZAM) Operations, Supply Chain and Services Management Conference held in Brisbane in June 2013.

This section has been removed for
copyright or proprietary reasons.

Section 6.1: L'Hermitte, C., Bowles, M. and Tatham, P.H. (2013), "A new classification model of disasters based on their logistics implications", in Lane, R. and Kahn, D. (Eds.), 11th ANZAM Operations, Supply Chain and Services Management Symposium, Brisbane, Australia, 20-21 June.

CLASSIFYING LOGISTICS-RELEVANT DISASTERS: CONCEPTUAL MODEL AND EMPIRICAL ILLUSTRATION

Cécile L'Hermitte

Australian Maritime College, University of Tasmania

Peter Tatham

Department of International Business and Asian Studies, Griffith Business School

Marcus Bowles

Australian Maritime College, University of Tasmania

Abstract

Purpose - The purpose of this paper is to use a theory-based approach to develop a new classification model for disasters that reflects their logistics implications, and to contextualise the findings by applying the model to a particular disaster situation.

Design/methodology/approach - A widespread literature review was conducted in order to conceptualise the proposed disaster classification model and a case study (the 2011-2012 Somali food crisis) was used to provide a practical illustration and an initial validation of the conceptual approach.

Findings - The new classification model proposes a set of four categories of disasters based on two generic dimensions, whilst simultaneously integrating five situational factors that reflect the impact of the external environment on the logistics operations. The case study confirms that this systemic approach is necessary since, from a logistics perspective, a disaster should be considered in its entirety and within its contextual environment.

Research limitations/implications - Further research is needed to establish the operational characteristics of each disaster type in order to determine the applicability of business logistics practices to each scenario. In addition, this paper highlights the opportunity to validate or refine the model by using a more varied range of case studies.

Originality/value - This paper proposes a new classification model for disasters based on their logistics implications and, by integrating the key environmental factors, it moves beyond the traditional 2x2 model found in the literature.

Keywords - Humanitarian logistics; Disaster classification; Typology building; Open systems; Generic characteristics; External environment

1. Introduction

A disaster is defined by the United Nations (UN) as 'a serious disruption of the functioning of a community or a society involving widespread human, material, economic or

environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources' (UNISDR, 2007). This definition reflects huge variety in the implications and response conditions of a disaster and this, inevitably, creates significant difficulties for the researcher. As a way of attempting to rationalise this potentially confusing picture, a number of disaster classifications have been developed within the disaster management literature (see Shaluf, 2007; Eshghi and Larson, 2008). However, none of the existing classifications explicitly reflects the logistics implications of such events (L'Hermitte *et al.*, 2013). Since disasters generate diverse operational environments (and, hence, logistics responses), it is important to differentiate between disaster categories in order to develop appropriate analyses and consequential recommendations that will enhance the efficiency and/or effectiveness of the logistics operations (Holguín-Veras *et al.*, 2012).

The objectives of this paper are two-fold: (1) to propose a new classification model for disasters that reflects their logistics implications and (2) to contextualise the findings by applying the model to a particular disaster event. To this end, the next section describes the methodology used in this research. This is followed by a section which presents the conceptual framework (based on typology building and the concept of open systems). In the subsequent section, the limitations of the typology commonly used in the humanitarian logistics literature are addressed, before the new disaster classification model is presented. A case study analysis of the proposed model based on the 2011-2012 Somali food crisis is provided in the next section. Following this, the value and conclusions of this work are summarised and its limitations are identified. The final section synthesises the research.

2. Methodology: literature review and case study

The development of the new classification model is based on a widespread review of the literature in various academic fields. First, the literature relating to the construction of typologies and the general system theory (in particular the model of open systems) was used to develop the conceptual framework of this paper and to provide an overview of the optimal approach for developing the two-level classification framework. This review is designed to be complementary to L'Hermitte *et al.* (2013) who consider the academic literature in the social science of disasters. In addition, this approach is similar to the one chosen by Pettit and Beresford (2009) who draw on another academic discipline and identify the relevant aspects to the field of humanitarian logistics. To that end, and in line with the work of Kunz and Reiner (2012), we searched the ProQuest, Business Source Premier, and Scopus databases, as well as Google Scholar using the following keywords:

- "General system theory" or "General systems theory" or "Open system" or "Open systems",
- "Typology" or "Typologies" or "Typological" or "Taxonomy" or "Taxonomies" or "Classification" or "Classifications".

Citations from relevant articles were also used to expand the research. The results were, then, considered alongside the HUMLOG bibliography developed by Peter Tatham (HUMLOG,

2015). The overall aim was to understand the limitations of the commonly used typology based on the nature of disasters and the speed of onset, as well as to identify the emergent discussions regarding alternative classifications.

In addition to the literature review, a case study is used to illustrate the proposed model in a real-life context. Since the reality of disasters is that they are complex systemic phenomena or ‘wicked problems’ (Tatham and Houghton, 2011), a case study is an appropriate research approach to use when exploring and attempting to make sense of this complexity (Yin, 2003; Flyvbjerg, 2006). This paper is based on a single case study, namely the 2011-2012 Somali food crisis. The selection of this case is information-orientated (Flyvbjerg, 2006) and reflects the fact that this particular event (or series of events) is an extremely complex disaster (WFP, 2011) and will, therefore, be instructive and generate a large variety of logistics situations and operational challenges.

The source of evidence used in the case study is secondary documentation and draws, in particular, on the relevant operational reports of the UN Logistics Cluster. According to Yin (2003), such documentary information is a valid source of evidence in case study research as long as the documents are accurate and not biased. Clearly, this can be an issue if the documents used have not been written for the purpose of the case study, but rather for another use or a different audience.

The Logistics Cluster is a UN coordination mechanism whose objective is to coordinate the relief logistics activities of UN agencies and other humanitarian organisations. To that end, and in order to support field operations, the Logistics Cluster concentrates logistics expertise, facilitates interactions, and disseminates accurate, timely, and quality information to the humanitarian community (Logistics Cluster, 2015a). Given their operational orientation, the validity of the Logistics Cluster’s documentary sources can be assumed for the purpose of identifying the various logistics challenges and implications of a disaster.

Table 1 shows the 79 reports reviewed. These were selected from the totality of reports available on the Logistics Cluster website on the basis of their incorporation of specific logistics information.

Name of document	Author(s)	Number of documents	Date of first document	Date of last document
Meeting minutes	Logistics Cluster Coordinator + Logistics Cluster Information Management Officer	43	22/07/2011	23/11/2012
Situation report	Logistics Cluster Coordinator + Logistics Cluster Information Management Officer	31	11/08/2011	02/07/2012
Weather – road and port conditions in Somalia	Logistics Cluster Coordinator + Logistics Cluster Information Management Officer	4	25/10/2011	29/11/2011
Concept of operations	Logistics Cluster	1	20/04/2012	N/A

Table 1: Documentary sources used for the case study

Further information regarding the methodological approach to the case study will be provided later in the paper after the details of the model (i.e. the details of the analysis framework) have been discussed.

3. Conceptual framework

3.1. The construction of typologies

A typology is defined as a ‘multidimensional classification’, in other words, ‘a grouping of entities on the basis of similarity’ (Bailey, 2000, p. 3180). Some authors (such as Doty and Glick, 1994) make a distinction between a classification and a typology. However, given that these terms are used interchangeably within the social sciences literature (Bailey, 2000), this approach will also be used in this paper.

Various authors provide guidance as to what constitutes a good classification. Thus, Sandri (1969) argues that, since a series of data can be classified along various dimensions, the rationale for choosing meaningful dimensions is important when building any classification model. Ultimately, as Bailey (1994) observes, a classification is as good as the dimensions on which it is based, or, put simply, pointless dimensions produce pointless classifications. Further crucial elements are exhaustivity (all the entities to be classified belong to one cell type) and mutual exclusivity (the entities cannot belong to two different cell types) (Tiryakian, 1968; Bailey, 1994). According to McKinney (1969), good typologies are functional, in the sense that they contribute to the analysis and prediction of the studied phenomena. Similarly, Sandri (1969) argues that the chosen dimensions must be empirically relevant to enable researchers to derive valid explanations and predictions. For Bailey (1994), good typologies are versatile. This means that they are not only based on conceptual considerations, but can also be used to conduct empirical investigations. These discussions show that the empirical verification of the types identified by the classification process is crucial (McKinney, 1966) and this approach is operationalised through the case study later in this paper.

Typologies have been criticised by a number of authors for being simplistic and unsophisticated (Collier *et al.*, 2012). It is accepted that any phenomenon is a unique occurrence in space and time so that typologies are, to some extent, generalisations that cannot capture the whole diversity and complexity (McKinney, 1966; Tiryakian, 1968; McKinney, 1969; Bailey, 2000). They are also constructs that stem from the researcher’s mind and, as such, may (and probably do) not exactly match the reality. However, it is argued that, provided the empirical approximations are valid, they are a useful means for organisation, conceptualisation, and analysis (Becker, 1940; Bailey, 1994). Indeed, typologies are a helpful descriptive tool (Bailey, 1994) that enables scholars to reduce and make sense of the complexity of a particular phenomenon (McKinney, 1966; Bailey, 1994; Doty and Glick, 1994). They also allow researchers to identify subsets of research (Collier *et al.*, 2012), to focus on an isolated set of characteristics, and to predict the likely outcomes of these circumstances (Becker, 1940).

3.2. *Open systems and the impact of the external environment*

As commonly defined (for example by Ackoff, 1971; Kast and Rosenzweig, 1972; Daellenbach and McNickle, 2005), a system is an integrated whole made of interrelated elements. Whilst systems can be found in many fields of science, the general system theory has a degree of abstraction and generalisation sufficient to be applicable to a large number of disciplines (von Bertalanffy, 1950; Boulding, 1956; von Bertalanffy, 1972). This widespread applicability, as well as the focus of the general system theory on open systems (von Bertalanffy, 1968), make this theoretical concept appealing to the present research because its overall principles can be used to refine the concept of a disaster and to understand it as a system.

A system is said to be open when its behaviour and performance are influenced by its external environment (Ackoff, 1973). A system can also be so integrated into its environment that system and environment become one entity (Luhmann, 1995; Heil and Droege, 2006). This is the case of disasters, as will be evidenced later. As it is not possible to control and predict all the behaviours and intricate influences, open systems have to deal with uncertainty (Thompson, 1967). It is, nevertheless, argued that one should identify, as much as possible, the variables and interactions in order to better understand them and be in a position to reduce the level of uncertainty. Thus, clearly identifying and carefully studying the nature of the external environment is important (Katz and Kahn, 1978) in order to optimise decision-making by achieving better control on known variables and interactions and by better adapting to unknown elements.

In relation to this paper, the open systems theory justifies the inclusion of the external environment in the model that will be presented later. It also provides a dynamic perspective to our analysis, as discussed in the next sub-section.

3.3. *Linking typologies and systems*

Typologies and systems are highly related concepts. Thus, McKinney (1969) argues that types within a typology do not exist in isolation, but within a specific context. Consequently, types feature both a classification and a systemic perspective. The classification perspective is based on the similarity of constructed attributes, whereas the systemic perspective emphasises interconnectedness and the inclusion of the studied phenomena into an integrated whole. By not considering both these levels of analysis, researchers are at risk of not providing an accurate representation of the reality.

This analysis echoes von Bertalanffy's (1950) view that there are two levels of analysis for any phenomenon. On one hand, the classification level, by picturing patterns, results in a static view of the event. On the other hand, the system level, by focusing on relationships and interactions, leads to a dynamic understanding of the same phenomenon. Similarly, Katz and Kahn (1978) identify two aspects of the system structure: the system's character (the predictable elements of the system) and the system's openness (the continuous interactions between the system and its environment). For the purpose of this paper, both levels of

analysis are helpful and will be used in relation to the proposed disaster classification model. However, before doing so, it is important to evaluate the value of the most frequently used typology of disasters in the light of the concepts and criteria that have been previously developed and, thereby, demonstrate its limitations.

4. Limitations of the currently used typology of disasters

The humanitarian logistics literature frequently refers to Van Wassenhove's (2006) typology that makes a distinction between slow- and rapid-onset disasters, and between natural and man-made events (Figure 1). Although this typology is a descriptive tool and its author does not propose its use as a logistics-relevant categorisation of disasters, to date, it has been the most commonly used classification of disasters in the humanitarian logistics literature. However, this paper identifies the reasons why, from a logistics perspective, this typology is not optimal for use as an analytical tool.

	Natural	Man-made
Sudden-onset	Earthquake Hurricane Tornado	Terrorist attack Coup d'état Chemical leak
Slow-onset	Famine Drought Poverty	Political crisis Refugee crisis

Figure 1: Categories of disasters (Van Wassenhove, 2006, p. 476)

Although this typology is certainly simple and easy to understand, it is suggested that it does not capture the context and complexity of disasters (Kovács and Spens, 2009; Tatham *et al.*, 2013). Importantly in the context of this research, it does not reflect the logistics impact of an event (L'Hermitte *et al.*, 2013; Tatham *et al.*, 2013), nor the contextual variables and their interactions.

Figure 1's typology can be evaluated against two of the criteria previously developed in this paper, namely: (1) exhaustivity/mutual exclusivity and (2) empirical relevance. First, whilst the typology is certainly exhaustive (all disasters can be classified within it), it is not mutually exclusive because some disasters belong to two different types, as exemplified by a flood event (Kovács and Spens, 2009). Indeed, as explained by L'Hermitte *et al.* (2013), a flood can be categorised as a sudden-onset, a slow-onset, a natural, and a man-made disaster. Since a disaster has rarely only one cause (Kovács and Spens, 2009; Day *et al.*, 2012; Starr *et al.*, 2012), it can be extremely difficult to identify its origin (Quarantelli, 1991; Rosenthal, 1998) and, consequently, to attempt to classify it as a natural or a man-made event. From that

perspective, the horizontal dimension of the typology presented in Figure 1 (natural vs. man-made disasters) has limitations.

Secondly, the dimensions of the above typology do not reflect the reality of the studied phenomena and, in particular, the logistics implications of disasters. This is due to the fact that no valid predictions can be derived from the dimensions of this typology. As such, the above typology does not form a suitable basis for analysis. For example, it could be intuitively argued that sudden-onset disasters lead to emergency response operations, whereas slow-onset disasters can be more anticipated and, therefore, result in the availability of longer intervention times. In the reality, the speed of onset does not always reflect the time available for planning and preparing the humanitarian intervention. This is because sudden-onset disasters such as earthquakes evolve and become more stable situations in the recovery phase (Altay *et al.*, 2009; Hughes, 2009), whilst emergency situations exist in the context of slow-onset disasters such as famines. In respect of the latter point, Levine *et al.* (2011), Kim and Guha-Sapir (2012), and Maxwell *et al.* (2012b) clearly demonstrate that the humanitarian response to (albeit predictable, foreseen, and recurrent) food crises is repeatedly delayed so that aid agencies have to intervene in emergency once extremely dire famine situations have arisen. Thus, the vertical dimension of the typology presented in Figure 1 (sudden- vs. slow-onset disasters) also has clear limitations.

It is suggested that Figure 1's typology reflects what Quarantelli (1991) calls phenotypes (observable physical features), rather than genotypes (common non-observable features). More precisely, the dimensions of this typology reflect neither the underlying logistics features of a disaster (i.e. those common non-physical features from a logistics perspective) nor its operational implications. Rather, as L'Hermitte *et al.* (2013) argue, the typology presented in Figure 1 is more focused on the trigger events (i.e. the observable physical features) than on their outcomes. Consequently, this typology is based on dimensions that do not reflect the real-life circumstances of the operational response and, from a humanitarian logistics perspective, that do not support valid empirical investigations and, hence, the development of appropriate general disaster management practices.

Emergent discussions in the humanitarian logistics literature (Kovács and Spens, 2009; Tatham, 2009; Apte, 2010; Tatham *et al.*, 2013) argue for an alternative classification based on characteristics that better reflect the operational implications of disasters. Various researchers (Kovács and Tatham, 2009; Apte, 2010; Holguín-Veras *et al.*, 2012) have offered a number of relevant analysis dimensions and disaster characteristics. In our opinion, the most holistic classification framework to date has been proposed by Tatham *et al.* (2013) who provide an exhaustive list of thirteen disaster characteristics that impact on humanitarian logistics operations:

1. the time available for action,
2. the number of persons affected,
3. the population density of the impacted area,
4. the geographic extent of the impacted area,
5. the magnitude of the destruction,
6. the disaster duration,

7. the urbanisation level of the affected area,
8. the topography of the impacted area,
9. the climatic conditions,
10. the socio-economic circumstances of the impacted area,
11. the impacted area's Logistics Performance Index,
12. the level of political stability,
13. the probability of the event's historic occurrence and potential recurrence.

However, the work of Tatham *et al.* (2013) is limited to the identification of the logistics-oriented characteristics and a tentative scale for each of the characteristics outlined above. Whilst these authors do not develop any typology of disasters, their research can be extended by considering the following three dimensions in their analysis: time, space, and situational circumstances, as undertaken by L'Hermitte *et al.* (2013). These three commonalities are integrated into the building of the new disaster classification model presented in the next section.

5. A new classification model of disasters

Building on the above developmental work, the logistics-focused disaster classification model proposes four categories of disasters based on two generic dimensions (time available for action and geographic scope) and integrates five situational factors that reflect the impact of the external environment on the logistics operations. The derivation of this model is explained in the following sub-sections. However, a more detailed discussion about the construction of the model is available in L'Hermitte *et al.* (2013).

5.1. Typology of generically defined disasters

The overall idea behind this new typology is to identify disaster situations based on the logistics impact of the event (rather than on its physical features) and, consequently, to enable researchers and practitioners to differentiate, explain, and predict the disaster's operational context and outcomes. As logistics is about creating time and place value (Ballou, 2004) along the supply chain, and two crucial implications of disasters are when and where humanitarian supplies should be made available (PAHO, 2001), the row and column variables of the new typology are the time and space dimensions of disasters. The time dimension of a disaster is defined as the time available for action (e.g. for the delivery of the humanitarian supplies) (L'Hermitte *et al.*, 2013). Self-evidently, this relates to the level of emergency of the humanitarian operations. The space dimension of a disaster refers to the geographic scope of the affected area (L'Hermitte *et al.*, 2013). Within these two dimensions, the underlying characteristics provide further refinement.

Thus, the space dimension of a disaster is designed to differentiate between localised disaster situations that impact a contained geographic location, and diffuse disaster situations that impact a widespread geographic location (L'Hermitte *et al.*, 2013). Distinguishing localised

from diffuse disasters is essential from a logistics perspective because the geographic extent of a disaster influences the complexity of operations, not least the transport and distribution operations (Apte, 2010). Whilst the travel distances are smaller in the case of localised disasters (which facilitates the carrying out of logistics operations), responding to diffuse disasters is complicated by longer transportation distances and times. This leads to more complex and multi-layered distribution networks (Holguín-Veras *et al.*, 2012), sometimes across borders.

The time dimension of a disaster allows a distinction to be made between those: the emergency disaster situations characterised by a need for urgent action, and the protracted disaster situations characterised by the availability of longer distribution times (L'Hermitte *et al.*, 2013). Ultimately, the time dimension of a disaster is closely related to the stages of the disaster lifecycle. As illustrated by Safran's disaster management cycle (in ADB, 2004), disaster management is an ongoing process involving four phases (disaster occurrence, emergency response, recovery, and prevention) that aim to plan for and respond to a disaster, as well as to reduce its impacts. Obviously, in the framework of this research, it is expected that operations in the initial phases (disaster occurrence and emergency response) are carried out in response to emergency disasters whereas the later phases (recovery and prevention) are related to protracted disasters. Differentiating between emergency and protracted disasters also reflects the types of operations conducted by humanitarian organisations, such as World Food Programme (WFP). Thus, WFP conducts 'Emergency Operations' to provide immediate relief (WFP, 2015b) and 'Protracted Relief and Recovery Operations' to provide longer-term assistance and/or to re-establish livelihoods (WFP, 2015e).

Figure 2 presents the newly created typology of generic disaster situations based on their logistics implications.

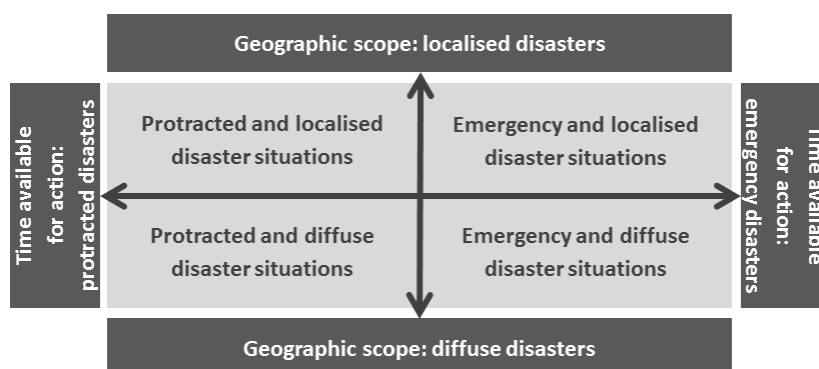


Figure 2: Typology of generic disaster situations based on their logistics implications

As typologies never exactly match real-life situations, each cell represents a polar type (or a representative extreme opposite type) (Bailey, 1994). In reality, each dimension should be

seen as a continuous variable (Collier *et al.*, 2012) so that the four types identified in Figure 2 do not constitute perfectly homogeneous areas (McKinney, 1966). However, it is suggested that they are sufficiently homogeneous to serve as a sound basis for analysing the logistics implications of each type of disaster situation.

This typology represents the first level of the proposed classification model. In doing so, it will be recognised that it represents the predictable and static part of the model, as will be further developed in a later section. Importantly, it is not considered to be sufficiently comprehensive to reflect the reality of a disaster from a logistics perspective. Thus, and as outlined by von Bertalanffy (1950) and by Katz and Kahn (1978), a second level of analysis is needed that will provide a dynamic dimension.

5.2. External situational factors

Using the work of Kunz and Reiner (2012), L'Hermitte *et al.* (2013) identify five external situational factors that need to be considered over and above the characteristics of the disaster itself because they affect the logistics operations and the associated performance of the humanitarian response. These five environmental elements are:

- The government situational factors,
- The socio-economic situational factors,
- The infrastructure situational factors,
- The physical situational factors,
- The security situational factors.

It should be noted that the term 'environmental' used in Kunz and Reiner (2012) and in L'Hermitte *et al.* (2013) has been replaced by 'physical' situational factors in this paper to avoid any possibility of confusion with the term 'environment' that is used to refer to the whole external environment (that includes the five situational factors). In addition, the 'conflict' situational factors have been replaced by the more overarching 'security' situational factors as a result of the case study analysis, as will be explained later. The impact of these situational factors on logistics operations has been emphasised in L'Hermitte *et al.* (2013) and will be considered again later in this paper in relation to the Somali case study.

For now, it is essential to note that the five environmental factors are dynamic in the sense that there are interactions between them, and that they create obstacles and complexities in the logistics operations. In respect of the latter aspect, Katz and Kahn (1978) propose four general dimensions in order to qualify the level of complexity in the external environment: stability-turbulence, diversity-homogeneity, clustering-randomness, and scarcity-munificence. These dimensions can be used to understand the level of complexity generated by the external situational factors in the field of humanitarian logistics, as is now explained.

First, the stability-turbulence dimension relates to the changing nature of the environment (Katz and Kahn, 1978). Turbulences exist in the disaster environment. For example, a conflict environment can create instability (such as a sudden rise in tension or unexpected

population movements), as does the government environment (e.g. political instability due to a breakdown of law and order).

Secondly, the diversity-homogeneity dimension refers to the degree of variety or uniformity in the environment and, consequently, to how difficult/easy it is to understand and adapt to it (Katz and Kahn, 1978). Considerable variety is generated by the disaster's external environment, as exemplified by the diversity of physical environments (for example: rural, urban, mountainous), or the large number of actors that humanitarian organisations have to deal with in a conflict environment (Grünewald, 2012). These actors can be rebellious groups, warlords, militias, or guerrilla forces, as well as the military forces of both the affected country and any international participants.

Thirdly, the clustering-randomness dimension relates to the level of organisation/anarchy in the environment and, consequently, to its level of continuity and accessibility (Katz and Kahn, 1978). In humanitarian logistics, randomness and the lack of operational continuity or accessibility are generated, for example, by the infrastructure environment (when the physical or communication infrastructure is inadequate or has been destroyed) or the government environment (e.g. weak governance and/or predatory approaches leading to corruption) (Maxwell *et al.*, 2012a). The security environment is another cause of randomness, for example when a conflict gives rise to ambush and cargo pilferage (and other types of diversion of humanitarian supplies), as well as to violent acts against aid workers (Stoddard *et al.*, 2006; Stoddard *et al.*, 2009).

Fourthly, the scarcity-munificence dimension refers to the level of resources (natural, technological, skills, etc.) available (Katz and Kahn, 1978). As an example, scarce resources exist in the disaster's socio-economic environment when there is a lack of commercial transporters or any other logistics service providers in the disaster area.

Taken together, these four dimensions determine the level of complexity that humanitarian organisations encounter and have, subsequently, to manage. In short, the external situational factors either facilitate operations or generate disruptions that prevent the flow of humanitarian supplies and, thus, hamper the logistics and supply chain performance (in terms of efficiency and effectiveness). Consequently, it is argued that, from a logistics perspective, a study of disasters cannot dissociate the disaster itself from its external environment. Both are interlocked as demonstrated in Figure 3 that represents the generically defined disasters within their external environment.

We argue that any given disaster can be classified by using the four dimensions of the matrix (emergency/protracted and diffuse/localised) because they reflect the core attributes of disasters. However, it should be noted that a disaster is not expected to be placed in any of the five categories representing the external situational factors. These elements have been added to the model because they greatly impact on operations and on the logistics decisions, and because a disaster is so integrated into its external environment that it is best represented as one entity. Thus, integrating both levels of analysis into a single model is essential as a means of understanding the complexity and dynamism of the reality of a disaster. Furthermore, it should be noted that the five external situational factors do not exist in

isolation, but interact with each other. In order to understand this inherent complexity, further explanation regarding the developed model is provided in the next section.

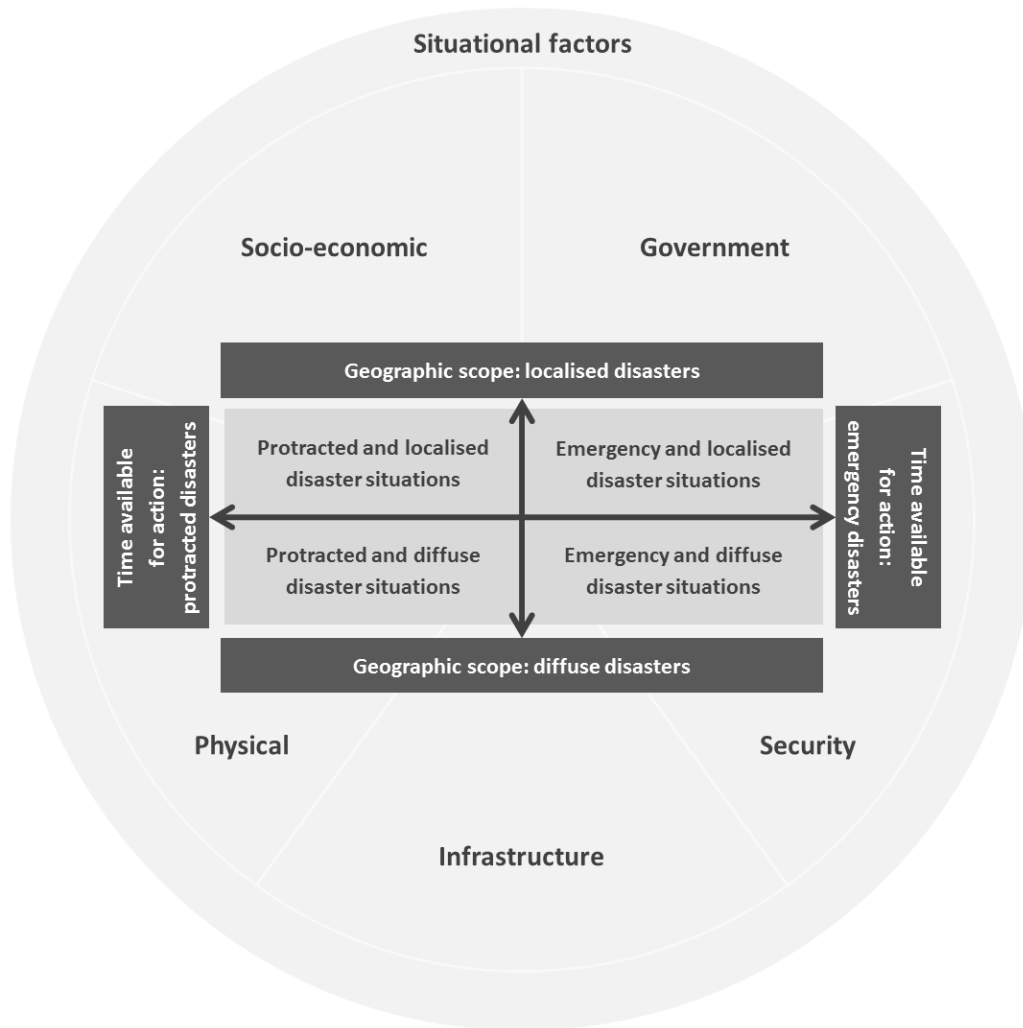


Figure 3: A classification model for logistics-relevant disasters

5.3. Model analysis and discussion

The first part of the model (the typology of disasters) represents the static and predictable part of the model in the sense that it is not integrated into the external environment and that the operational context can be predicted. In this instance, the term ‘predictable’ does not refer to the disaster itself. A disaster can be unpredictable (as is, for example, an earthquake), but the operational outcomes of and the response to this disaster can be predicted on the basis of the generic logistics characteristics of a disaster.

Thus, general logistics and supply chain practices and strategies can be considered for each type of generically defined disaster. For example, a strategy of operational efficiency optimisation is likely to be appropriate in the case of localised and protracted disasters. This is because localised disasters facilitate the achievement of economies of scale (Tatham *et al.*, 2010), whilst protracted disasters generate a higher level of demand predictability and more regular and repetitive demand patterns (Holguín-Veras *et al.*, 2012).

By contrast, emergency disasters create more erratic logistics conditions because humanitarian organisations have to face the challenges of responding swiftly to emerging demand. Gattorna (2006) argues that organisations can respond to crisis situations by implementing ‘fully flexible’ supply chains (the extreme level of supply chain agility). He further explains that fully flexible supply chains are appropriate response strategies in the humanitarian context and, in particular, in emergency situations where the highest level of responsiveness (and low price consideration) is needed to meet unpredictable demand.

Supply chain agility is also needed in the case of diffuse disasters because they generate greater uncertainty and complexity (L'Hermitte *et al.*, 2013). Indeed, a diffuse disaster is more likely to be subjected to the influences of the external environment and, therefore, to generate a more complex operational environment (due, for example, to the variety of physical environments humanitarian organisations have to work in, the range of actors they have to deal with, or the different levels of emergency they have to face). Put simply, diffuse disasters are likely to create a greater variety of operational contexts.

Clearly, the above analysis only touches on the suitability of specific supply chain strategies to particular disaster situations and, as will be discussed later in this paper, further research is needed in this area. Nevertheless, it is argued that, as a first step, developing a categorisation of disasters on the basis of their logistics implications will facilitate the development and applicability of general logistics and supply chain practices and strategies that will, in turn, enhance the performance of the supply chain in response to each type of disaster. This approach is in line with the view of Holguín-Veras *et al.* (2012) who note that researchers are prevented from developing relevant analyses and recommendations for improving humanitarian operations by the lack of differentiation between operational environments in humanitarian logistics.

Whilst the first part of the model is based on similarity (of the constructed attributes), the second part reflects the dynamic circumstances of a disaster situation because the external situational factors create uncertainty and a swiftly changing environment in which humanitarian organisations must be able to operate. The external environment is also specific to each disaster. Therefore, it poses particular challenges to humanitarian logisticians (Kovács and Spens, 2009) and accounts for the uniqueness of each particular supply chain conditions (Whybark *et al.*, 2010). From this perspective, it is evident that, like many other organisations, a humanitarian organisation is an open system interacting with its external environment. Therefore, in order to operate efficiently and effectively, humanitarian organisations must manage the disruptions generated by the disaster external environment. In other words, they must reduce uncertainty and/or develop coping mechanisms. To do so, it is argued that humanitarian organisations must build dynamic capabilities that enable them to

quickly respond to disruptive events, better deal with unpredictability, and protect operations from external influences.

6. Applying the new classification model to the 2011-2012 Somali food crisis

6.1. The 2011-2012 Somali food crisis: background information

In 2011, more than 13 million people were affected by the drought in the Horn of Africa (Somalia, Kenya, Ethiopia, Djibouti, and Eritrea). Among these, 4 million people in Somalia (about half of the population) were in need of humanitarian assistance (CRS, 2012). On 20 July 2011, the UN declared a state of famine in two regions of the Southern part of Somalia (CRS, 2012) based on indicators measuring food consumption, nutrition, and mortality (Haan *et al.*, 2012). In August and September 2011, famine was declared in four more regions, with three of these reclassified from 'famine' to 'humanitarian emergency' in November 2011. This situation triggered massive population displacements of 2.4 million Somalis. Some of them joined cross-border refugee camps, mainly in Kenya, Yemen, and Ethiopia, whereas others became Internally Displaced Persons (IDPs) within Somalia (CRS, 2012).

Whilst drought (leading to crop failures, livestock deaths, loss of livelihood, and soaring domestic food prices) was the dominant reason for the humanitarian crisis in Somalia, the situation was exacerbated by other factors such as rising international food prices (Somalia is significantly dependent on food imports) (Maxwell and Fitzpatrick, 2012), political instability, lack of authority and policy making, an environment of insecurity due to the insurgence of the rebel Islamist group, *Al-Shabaab* (CRS, 2012), *Al-Shabaab's* ban on foreign intervention and aid agencies since 2009 leading to increased livelihood vulnerability (Lautze *et al.*, 2012; Menkhaus, 2012), US counter-terrorism laws suspending US food aid deliveries to areas controlled by *Al-Shabaab* (Menkhaus, 2012), and increasing fuel prices impeding transport and food distribution (CRS, 2012). All these factors explain why Darcy *et al.* (2012) call the drought crisis in Somalia 'a crisis within a crisis' and, thereby, illustrate the point made previously in this paper regarding the existence of multiple causes leading to a disaster.

Very sophisticated disaster detection systems are available in Somalia (Darcy *et al.*, 2012; Hillbruner and Moloney, 2012). Repeated early warnings regarding the Somali drought, acute malnutrition, and the risk of famine had already been released by the end of 2010, but these did not result in an early humanitarian intervention (neither preventive action nor early relief) to the extent required. Consequently, urgent action had to be taken to deliver emergency supplies mid-2011 (Darcy *et al.*, 2012; Kim and Guha-Sapir, 2012; Lautze *et al.*, 2012) when the food crisis in Somalia had become extremely severe and had already resulted in extensive loss of life (Hillbruner and Moloney, 2012).

It is not our intention to lay the blame on the humanitarian organisations as they, obviously, anticipated the approaching crisis (Oxfam, 2012). What is essential and relevant here is that, after the July 2011 famine declaration, the Somali famine (albeit a typical slow-onset

disaster) was treated as any sudden-onset emergency (Hobbs *et al.*, 2012). Thus, due to the need for urgent action and for immediate distribution of humanitarian supplies, the Somali disaster is categorised as an ‘emergency disaster situation’ (in reference to the proposed classification model presented in Figure 3). It should be noted that the level of emergency not only reflects the famine itself, but also its dynamic effects: overcrowded and inadequate refugee camps leading to multiple health issues, security problems such as robbery and sexual violence, and rising tensions between communities (OCHA, 2011).

Although the famine was mainly located in the South-Central part of Somalia, most of the Somali territory was affected by either humanitarian emergency or acute food and livelihood crisis (Maxwell *et al.*, 2012b). The affected populations were diverse and included people living in pastoralist and agro-pastoralist communities, urban areas, IDP settlements, and cross-border refugee camps (FSNAU, 2011). As a consequence, and in reference to the proposed classification model presented in Figure 3, the Somali food crisis is categorised as a ‘diffuse disaster’. Further detail regarding the logistics implications of this classification will be provided in a later section.

6.2. Methodological approach to the case study research

This case study is designed to identify the logistics-oriented characteristics and implications of the 2011-2012 Somali food crisis. In doing so, this paper aims to demonstrate that the proposed classification model offers a route to comprehend the complexity of this particular disaster and, consequently, that the model can be used to conduct empirical investigations.

To do so, the documentary sources presented earlier in Table 1 were reviewed with the aim of understanding how the various variables of the proposed model impact on the logistics operations. To that end, a seven-dimensional framework was used to analyse the documents and identify the operational implications. This framework is based on the dimensions integrated into the classification model presented in Figure 3 and, therefore, includes the following:

- The logistics characteristics of the studied disaster (the time and space dimensions of the model, i.e. emergency and diffuse in this particular case),
- The five external situational factors.

For the purpose of possibly refining the model, the authors have also listed the elements that do not fit any category of the model but that should, nevertheless, be taken into account due to their impact on the logistics activities. Thus, the objectives of this study are twofold:

- To ascertain the appropriateness of the model categories to approach disasters from a logistics perspective,
- To describe the impact of the broader environment on logistics operations and, thus, to demonstrate the relevance of a two-level classification framework.

A map of Somalia showing the administrative regions as well as the ports is provided in Figure 4 to enhance the understanding of the case study analysis. As some readers may need more extensive mapping information, a more detailed map is available on the Logistics Cluster website (Logistics Cluster, 2011).

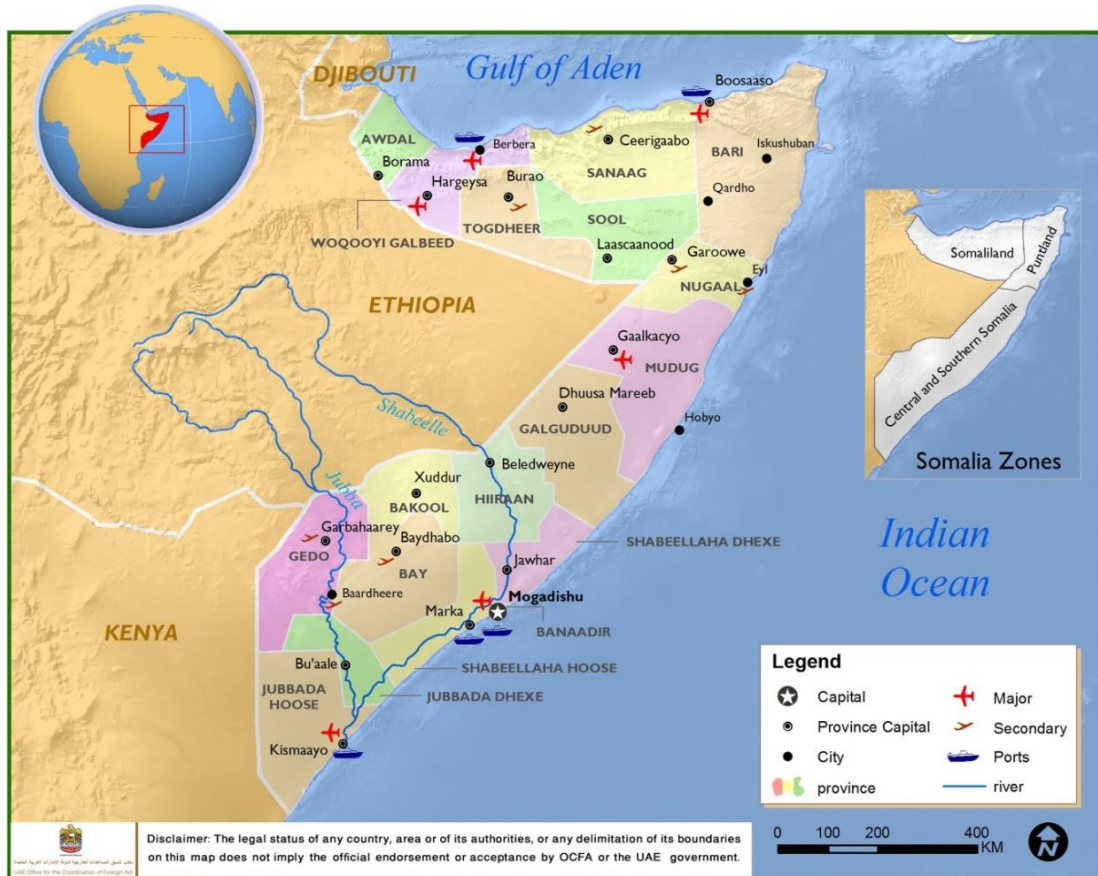


Figure 4: Administrative map of Somalia (OCFA, 2011, p. 3)

6.3. The space and time characteristics of the 2011-2012 Somali food crisis

The case study illustrates the space and time dimensions of the model and, in particular, provides valuable information regarding the logistics challenges associated with a diffuse and an emergency disaster situation. What follows is, thus, an analysis of the specific set of characteristics distinguishing this particular type of disaster (diffuse and emergency).

Several logistics implications relating to the diffuse characteristic of the Somali disaster demonstrate the higher level of complexity associated with diffuse disasters. First, the case study shows that a diffuse disaster situation results in a heterogeneous operational environment to which humanitarian organisations have to adapt. This not only relates to the variety of intervention environments (urban, rural, or refugee camps), but also to the

diversity of operational practices. For example, different ports have different berthing rules and priorities. Secondly, the widespread geographic scope of the studied disaster results in the movement of humanitarian supplies through various land corridors and over large distances. Thirdly, the documents report a number of cross-border logistics challenges. These include the remote management of the crisis (with humanitarian organisations operating out of Kenya due to security issues) bringing about inadequate logistics coordination, the lack of port capacity resulting in humanitarian organisations using overseas ports (so that congestion at Mombasa Port in Kenya affects the deliveries to the Somali population), or the cross-border refugee movements that complicate logistics planning and operations. Population movements lead to new logistics requirements such as remapping the refugee locations, additional need for food supplies and non-food humanitarian items (such as shelters and health kits), and increased storage requirements in refugee camps. This issue of population displacement shows that a diffuse disaster can evolve in space.

In addition to the space dimension, the time dimension (i.e. emergency disaster requiring immediate assistance) is also reflected in the case study. First, the need for urgent action is particularly clear at the first stage of the disaster, as illustrated by the need to deliver essential items (such as food or medicines) rapidly, and the resultant use of air transport (before deliveries by road can be arranged). Then, the case study demonstrates that new emergencies can develop at any moment, such as in March 2012, when refugees (mainly from Kenya) returned to the Hiiran and Bay regions (South-Central Somalia) in great numbers in part following *Al-Shabaab's* withdrawal from many towns. Humanitarian organisations had to swiftly identify immediate needs, target populations, and accordingly adapt their response strategy.

The documents also refer to the uncertainty typically associated with an emergency disaster situation. For example, they reveal that humanitarian organisations lack basic information, in particular at the start of the disaster event. This lack of information relates, among other issues, to transport rates, mechanisms to transport cargo out of the port of entry to destinations within Somalia, and mapping details. Finally, the emergency characteristic of the disaster is reflected in the fact that logistics activities are not fully operational at the beginning of the disaster period and, consequently, in the need to set up the operational framework, i.e. to establish humanitarian pipelines such as land corridors or airstrips.

The 2011-2012 Somali disaster shows that the level of emergency of a disaster can evolve over time. Thus, in February 2012, improvements in food security and the reduction in mortality levels brought the two main organisations in charge of food security surveillance (FSNAU and FEWS NET, 2012) to announce the end of the Somali famine. Clearly, this does not mean that humanitarian assistance is no longer needed, but that the level of the emergency has evolved. Thus, the categorisation has changed and the Somali disaster has evolved from an emergency disaster to a protracted disaster. In this respect, it will be seen that, from 2012, humanitarian organisations have moved from emergency life-saving to recovery assistance and, consequently, have been conducting protracted operations in Somalia (WFP, 2012b).

In summary to this section, the case study describes the operational environment of a diffuse and emergency disaster and confirms that these events generate such a degree of operational uncertainty and complexity that the response strategy of humanitarian organisations must be totally focused on responsiveness and flexibility. Clearly, as will be discussed later, this point has to be more deeply investigated. The case study also demonstrates that disasters evolve and move from an emergency situation to a protracted situation in the recovery phase.

6.4. The external situational factors of the 2011-2012 Somali food crisis

The case study illustrates the five external situational factors of the disaster classification model presented in Figure 3. Each of them is now considered.

The impact of the infrastructure environment on the logistics operations is repeatedly referred to, in particular due to the lack of port capacity. This leads to recurring congestion issues at the various ports used as points of entry for the deliveries of relief items to Somalia (Dar Es Salaam in Tanzania, Mombasa in Kenya, Mogadishu, Bossaso, and Berbera in Somalia, as well as Djibouti). Congestion results in delays in berthing (sometimes reaching 20 days, such as at Mombasa Port's bulk terminal in December 2011) and in cargo handling. In addition to overstretched port capacity, the reviewed documentation mentions as an infrastructure issue the inadequacy of the design of Mombasa Port where too few gates are used by a large number of vehicles.

The impact of the physical environment is also widely reported in the case study documents. Poor weather conditions lead to multiple logistics disruptions, including delays in loading and discharging vessels (compounding berthing delays), and to the deterioration of road conditions resulting in operational delays on supply routes (because some muddy or flooded roads are impassable or, when passable, vehicles must move slowly). This, in turn, slows down the turn-around time of trucks causing a shortage of trucking capacity and, therefore, further delays in the deliveries of humanitarian supplies. Poor weather conditions not only impede truck movements, but also result in the inability to use certain airstrips. In addition, heavy rains and flooding bring about further population movements (due to property destruction, crops being damaged, and the death of domestic animals) and also impact on the logistics operations in camps. For example, rainy conditions increase the need for shelter items or health kits (to prevent the risk of acute watery diarrhoea or the spread of diseases such as cholera, measles, and malaria).

The case study demonstrates how a range of socio-economic factors affects logistics operations. In particular, the reviewed documentation shows that logistics challenges are brought about by the lack of available resources and labour issues. The lack of resources includes shortfalls in storage capacity in Mogadishu and other locations in Somalia (resulting in higher storage prices), and the shortage of trucking capacity in Mombasa, Djibouti, Dar Es Salaam, and Bossaso (causing delays in discharging cargo and in transporting humanitarian supplies ex-port). The insufficient road transport capacity is compounded by the competition between humanitarian and commercial cargo. Thus, some transporters prefer to carry commercial cargo because the turn-around times are quicker, the routes are more lucrative,

and several commercial actors have agreed to pay in advance for the transport services. The shortages of available resources also relate to the absence of regular and reliable sea transport services (between the various ports within Somalia as well as between Mombasa and Mogadishu/other Somali ports) and air transport services (for cargo and passengers, i.e. the humanitarian personnel). The air operations are further impacted by the lack of fuel at Mogadishu airport in August 2011 that resulted in an increase in the cost of airlifts and the need to adapt operations by refuelling in Kenya. Finally, socio-economic factors include an ongoing labour shortage at Mombasa Port and the consequent labour disputes (between the dock workers' union and the Port Authority) that resulted in further delays in the loading and discharge of vessels.

A number of government situational factors and the related logistics issues are referred to in the case study reports. These include, for example, slow customs procedures that delay cargo movements. Likewise, a decision of the Puntland (North-Eastern Somalia) authorities not to allow large convoys (i.e. more than ten trucks per convoy) to cross the border from Somaliland (Northern Somalia) into Puntland greatly affected the humanitarian logistics activities. Separate clearance was required for each convoy and this led to the spreading out of the deliveries over longer periods of time and, consequently, to distribution delays. Another example of government factors impacting on logistics operations relates to an administrative decision designed to reduce congestion at Mombasa Port. According to the new rules, the time that transit containerised cargo could remain at the terminal before incurring storage charges was reduced from 11 to 9 days. This decision directly impacted on the already insufficient trucking capacity and the difficulty encountered by humanitarian organisations in finding transporters to carry relief items ex-port.

The case study also shows how the conflict environment impacts on the logistics operations, in particular as a result of the related security issues. These bring about massive population displacements, increased transport rates, coordination difficulties and, in turn, clearly affect the planning of operations and cargo movements. Other conflict environmental factors impeding the delivery of humanitarian supplies include mine threats and, most importantly, access-related restrictions. These are due, for example, to border closings or to *Al-Shabaab's* ban on humanitarian agencies from working in South-Central Somalia.

The documentary analysis reports the particular issue of maritime piracy that occurs in the Horn of Africa and results in the need to arrange for the vessels to have a naval escort. Undoubtedly, piracy is embedded into Somalia's broader political/conflict and socio-economic environments (Dua and Menkhaus, 2012). However, the piracy issue and the resulting security and logistics implications (Sullivan, 2010) do not seem to totally fit into the model as presented in L'Hermitte *et al.* (2013). Therefore, the 'conflict' situational factors have been renamed and a more overarching term used, namely 'security' environmental factors.

In addition to illustrating the five external situational factors, the documentary analysis shows the intricate interconnections between them. Thus, a number of logistics challenges are due to a combination of various factors. For example, the causes of heavy congestion at Mombasa Port (and the resultant delays) are the insufficient port capacity to meet the

commercial and humanitarian demand (infrastructure variable), labour disputes between the dock workers' union and the Port Authority due to ongoing labour shortages (socio-economic variable), and rainfalls (physical variable) impeding port operations and reducing the trucks' turn-around time, which, in turn, increases the shortage of trucks. The complex and entangled disaster external environment is also dynamic, in the sense that a logistics-relevant force can trigger a series of other logistics-related after-effects. For example, the administrative decisions made to reduce port congestion in Mombasa further impacts on the shortage of trucking capacity. This confirms the relevance of the systemic approach taken in this paper.

Finally, the study of the 2011-2012 Somali food crisis shows that the disaster environment is constantly changing. Changes concern all five environmental variables, for example: changing weather conditions (physical variable), fluctuating port congestion (infrastructure variable), changing trucking capacity (socio-economic variable), evolving administrative decisions (government variable), and security issues changing the level of accessibility to certain locations (security variable).

To conclude this section, the evidence in the case study strongly supports the use of the four dimensional conceptualisation of the external environment (stability-turbulence, diversity-homogeneity, clustering-randomness, and scarcity-munificence) developed by Katz and Kahn (1978) in order to qualify the level of complexity in the external environment. In the case of the 2011-2012 Somali food crisis, the disaster environment is highly turbulent (it is ever-evolving), diverse (the degree of variety is high), random (the level of continuity and accessibility is low), and scarce (the resources available are insufficient). It is, consequently, a very complex environment that generates numerous logistics challenges and impedes the delivery of humanitarian supplies to those in need. In addition, the case study shows that humanitarian organisations have very little (if no) influence on the broader external environment. Thus, they have to be responsive and flexible enough to adapt the complex and dynamic circumstances created by the external factors.

7. Research value and conclusions

This paper is a step towards an improved differentiation and categorisation of disasters in humanitarian logistics. By identifying common characteristics driving logistics needs, it highlights the existence of disaster situations (based on their logistics implications) as opposed to just disasters (based on their physical characteristics). As humanitarian logistics decisions are contingent upon the operational context, the identification of generic types of disasters is a first step towards the categorisation of logistics and supply chain practices and strategies associated with each type of disasters. Thus, the new typology will provide more structure to the humanitarian logistics discipline, help researchers to better differentiate the logistics environments, and will facilitate analysis. In particular, it will emphasise new research opportunities beyond emergency disasters that represent, to date, the main academic focus (Kunz and Reiner, 2012).

The literature review conducted and the case study analysis further demonstrate that logistics-relevant disasters cannot be categorised by only considering the common attributes of the disaster itself (emergency/protracted and diffuse/localised). This is not sufficient to reflect the reality of the logistics conditions. A holistic approach is necessary because humanitarian organisations operate in a highly complex and dynamic external environment that constantly disrupts the flows of supplies. As illustrated by the case study, disruptions include access limitations, capacity constraints bottlenecks, and security issues. Thus, the study of disasters and of the logistics operations in response to them must include the impact of the disaster's broader environment. As the exogenous factors making up this environment are intricate and beyond the control of humanitarian actors, organisations need to be flexible and responsive enough to adapt to the disruptive events. It is argued that the operational performance of humanitarian organisations is contingent upon their ability to build agile capabilities to swiftly respond to external disruptions and to conduct dynamic operations. In other words, operational performance depends on their ability to protect operations from external events.

In summary, although the contribution of this paper is primarily conceptual, it is argued that an improved differentiation between the disaster environments will assist researchers in focussing more on the drivers of logistics performance with consequential longer term benefits to practitioners.

8. Limitations and further areas of research

This paper forms the foundations of an ongoing study regarding supply chain disruptions and the drivers of performance in humanitarian logistics. At this stage, this work intends to clarify the concept of a disaster from a logistics perspective and to provide a new academic framework in order to make sense of the disaster situations. The proposed model should not be seen as definitive, but rather as a first reflection regarding the categorisation of disasters based on their logistics implications. In particular, as the paper is based on a single case study, the findings related to the validity of the proposed classification model must be understood in the context of the 2011-2012 Somali food crisis. It follows that, notwithstanding the illustrative case study used in this paper, further research is needed to test the model against further real-life circumstances and, in particular, a broader selection of disaster situations. This will provide new opportunities to refine the proposed classification.

In addition, since the paper is based on secondary data, the validity and utility of the new classification model need to be tested with practitioners so that its value as a decision-making tool can be better understood. In order to improve decision-making, further research is also needed to investigate the operational characteristics of each disaster type and the suitability of specific logistics and supply chain practices and strategies in response to particular disaster situations. Similarly, additional investigations should focus on the impact of the external environment on the logistics operations. Whilst this paper shows that the disaster broader environment generates disruptions, it does not provide any details regarding the way to reduce uncertainty and achieve responsiveness and flexibility in order to

overcome these disruptions and operate more efficiently and effectively. Consequently, a more detailed and scientific analysis of the interactions between a disaster and the humanitarian response is still needed. In particular, it should be understood how the knowledge about a disaster, its environment, and its logistics implications guides decision-making and action in the field.

9. Summary

This paper uses insights from theories, existing academic research, and empirical evidence to propose a new classification model for disasters based on their logistics implications. The theory-based approach uses the literature relating to the construction of typologies and to open systems in order to explain the development of the two-level classification model. This model shows that the nature of the humanitarian logistics operations is determined by the generic characteristics of the disaster itself and the external situational factors. It is argued that the disaster's generic characteristics enable researchers to predict the operational context, whereas the external environment creates uniqueness as well as uncertainty that interrupts the flow of humanitarian supplies. Consequently, this paper studies a disaster as a system. Understanding the system forces and interactions contributes to increased control, reduced uncertainty, and improved decision-making.

The case study confirms the validity of this systemic approach by demonstrating that, from a logistics perspective, a disaster is a highly intricate phenomenon made of interconnected elements and entrenched in its external environment. Consequently, a full analysis of the logistics implications of a disaster can only be achieved through the understanding of the influences of the external environment. As the environmental forces create numerous disruptions and account for the level of operational complexity that humanitarian organisations have to face, defining a disaster from a logistics perspective is only possible by integrating the disaster into its broader context and considering it in its complexity. Even in a disaster situation as intricate as the 2011-2012 Somali food crisis, a methodical analysis of the multiple variables has proved to be useful to make sense of the disaster complexity. This provides an initial validation of the conceptual approach.

6.3. Paper III

AN INTEGRATED APPROACH TO AGILITY IN HUMANITARIAN LOGISTICS

Cécile L'Hermitte

Australian Maritime College, University of Tasmania

Marcus Bowles

Australian Maritime College, University of Tasmania

Peter Tatham

Department of International Business and Asian Studies, Griffith Business School

Benjamin Brooks

Australian Maritime College, University of Tasmania

Abstract

Purpose - The purpose of this paper is to propose (1) a comprehensive model of the concept of agility in a humanitarian logistics context, and (2) to generate a research agenda to test and operationalise this model.

Design/methodology/approach - The paper draws on the dynamic capabilities model originated by Teece and uses a topical literature review of research in various business disciplines in order to reflect on the concept of agility in a humanitarian logistics context, to demonstrate that its current scope needs to be widened, and to propose an alternative approach.

Findings - The proposed model extends the existing concept of agility in a humanitarian logistics context by integrating agility drivers, responsive and flexible operations, agility enablers, and strategic level agility capabilities into a single model.

Research limitations/implications - Further research should focus on the nature of the risks/uncertainties encountered by humanitarian organisations, the interactions between the strategic and operational levels of such an organisation, and the impact of strategic level agility capabilities on field responsiveness and flexibility.

Originality/value - This paper brings new insights into the concept of agility in a humanitarian logistics context and contributes a model that reflects a more comprehensive understanding of this concept. In particular, it demonstrates that agility stems from strategic decisions and managerial practices.

Keywords - Humanitarian logistics; Humanitarian supply chain; Agility; Dynamic capabilities; Capacity building; Risk management

Article classification - Conceptual paper

1. Introduction

Agility is an essential attribute of any organisation operating in an uncertain environment as it underpins the organisation's ability to respond more rapidly and effectively to changes (Lee, 2004). Since humanitarian organisations typically operate in unstable environments, they need to embrace an agile strategy that enhances their capacity to respond to such risk and uncertainty (Charles *et al.*, 2010). Besides demand, supply, and process risks and uncertainties (Balcik and Beamon, 2008), humanitarian organisations have to deal with complex contextual factors (L'Hermitte *et al.*, 2014). These impose significant constraints on operations because humanitarian organisations frequently operate in the least developed countries where, for example, infrastructure is inadequate, the political environment is unstable, and/or violent conflicts are taking place (Long and Wood, 1995).

In the final report of its Policy and Research Conference held in 2011, the United Nations Office for the Coordination of Humanitarian Affairs (OCHA) identifies agility as a priority research theme (OCHA, 2012). However, although agility is repeatedly mentioned in the humanitarian logistics literature, there is as yet no settled definition or understanding of the concept. This paper is designed to remedy this deficiency through the development of a multi-level organisational view of supply chain agility. In other words, it considers the concept across multiple levels of an organisation rather than, as is often the case, solely at the operational level. In doing so, it begins with the premise that 'agility is a business-wide capability that embraces organisational structures, information systems, logistics processes and, in particular, mindsets' (Christopher and Towill, 2001, p. 236). Thus, supply chain agility not only reflects the flexibility and responsiveness of logistics and supply chain operations, but also the support provided by the strategic level to the operational level of an organisation. In other words, this paper intends to demonstrate that supply chain agility requires managerial and leadership inputs, i.e. that supply chain agility encompasses more than simply prepositioning supplies or swiftly deploying experts and assets to the field. It requires a managerial and leadership understanding of the problems encountered on the ground, of the resources needed to overcome these problems, and of the strategies to develop in order to appropriately support the logistics and supply chain activities in the field.

The paper draws on the dynamic capabilities model and uses a topical literature review of research conducted on agility in a business context and, in particular, within the agile manufacturing, software development, and supply chain disciplines. It reviews the approaches adopted in these fields in order to reflect on the concept of agility in the humanitarian context, to widen the current perception of its scope, and, ultimately, to contribute a new model of humanitarian supply chain agility. The resultant aims of the paper are (1) to propose a comprehensive conceptual model of agility in the context of humanitarian logistics and (2) to generate a research agenda to test and operationalise this model.

The remainder of the paper is organised as follows. Section 2 defines the concept of agility. Section 3 presents the theoretical premises used in the paper. Section 4 reviews the contributions of prior research on agility in various business disciplines and, on this basis, Section 5 identifies the gaps in the current humanitarian logistics literature. An alternative

approach to agility is proposed in Section 6 before an agenda for future research is suggested in Section 7. Next, the value and limitations of the work are identified in Section 8 and Section 9 synthesises the research.

2. Agility as the adaptive capacity of the whole organisation

Due to the complexity of their environment, organisations cannot anticipate all disruptions. Rather, they need to take a comprehensive and proactive approach to uncertainties in order to be prepared to manage multiple and unexpected events (Mitroff and Alpaslan, 2003). To do so, organisations typically choose a strategy that builds in redundancy along the supply chain (for example in terms of inventory or other operational capacity), or one that is designed to increase agility by developing their adaptive capacity at the organisational level (Chopra and Sodhi, 2004; Sheffi and Rice Jr., 2005; Tang, 2006). However, according to Sheffi and Rice Jr. (2005), redundancy generates costs. It also yields limited benefits because capacity is built at the operational level in response to a specific risk at a specific place. By contrast, investing in organisational agility fosters capacity building and development at the organisational level (i.e. the internalisation within the organisation) and enables organisations to leverage a set of capabilities across their operations. In other words, organisational agility contributes to the development of an internal adaptive capacity that, in turn, enables an organisation not only to respond to the issue at hand, but also to future uncertain and complex situations (Gunasekaran, 1998; Somers, 2009).

Thus, a distinction should be made between building capacity in terms of operational redundancy that inevitably increases costs (Gattorna, 2009) and developing an adaptive capacity at the organisational level, i.e. building the deep-rooted capabilities that underpin organisational agility and enable the organisation to mitigate risks and adapt to unpredictable circumstances (McCann and Selsky, 2012). McKinsey & Company (2006) argue that this latter type of agility leads to higher operational performance and cost-efficiency, especially when it is standardised and integrated into routine processes (Weick and Sutcliffe, 2001). Thus, organisations should consider the costs and benefits of both agile strategies and, when possible, supplement risk buffering by strategic risk management practices (Giunipero and Eltantawy, 2004).

Following on from the above discussion, this paper adopts a multi-level approach to the concept of agility, i.e. it will be considered both at the operational and at the strategic levels. We start from the premise that agility is needed to respond to operational disruptions that negatively impact on the movement of humanitarian aid. In this sense, our paper is about logistics and supply chain agility, i.e. conducting flexible and responsive operations in order to overcome disruptions.

We define flexibility as the ability to change what is being done at the operational level. Humanitarian organisations need to adapt their operating routines in different ways. Among other things, they need to be able to change the delivery location, the mode of transport used, and/or the transport routes as a result, for example, of bad weather, infrastructure breakdown, or changing security conditions (McGuire, 2011). We define responsiveness as the ability to

swiftly identify operational risks and opportunities and to respond to them in a timely manner. Clearly, flexibility and responsiveness are two essential components of operational agility as, for example, contended by Charles *et al.* (2010). However, we argue that focussing on operational level capabilities is not sufficient and that logistics and supply chain agility requires strategic inputs, i.e. strategic level capabilities.

With the above discussion in mind, we define agility as follows:

Agility is the adaptive capacity of an organisation as a whole to build strategic capabilities that support operational responsiveness and flexibility in order to manage existing or arising risks, uncertainties, and opportunities in the logistics and supply chain environment.

Figure 1 illustrates this definition and the concept of agility as it is used in this paper.

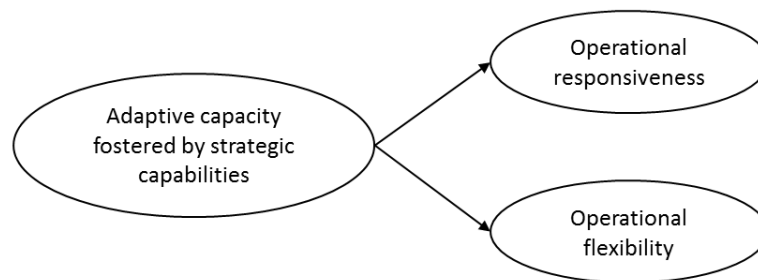


Figure 1: Agility as the adaptive capacity of the whole organisation

3. Theoretical insights

This paper builds on Teece's dynamic capabilities model (DCM) to examine the concept of agility. We do not pretend to offer an exhaustive review of the DCM literature but to provide an overview of the initial papers and of some of the more recent studies in order to demonstrate how this paper is developed from the DCM. The DCM is a theory of firm performance originated by Teece in the 1990s (Teece and Pisano, 1994; Teece *et al.*, 1997). Teece *et al.* (1997, p. 516) define dynamic capabilities as 'the ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments'. The model provides a structure that aims to explain how and why organisations capture a competitive advantage (Teece *et al.*, 1997) but differentiates itself from other strategic management theories by integrating various levels of resources (e.g. assets, skills, processes, procedures, structures, and systems) and by considering their (re)deployment, (re)configuration, and (re)combination in response to rapid changes in the environment (Teece *et al.*, 1997; Teece, 2009). From that perspective, the dynamic capabilities approach goes beyond technical fitness (i.e. operational skills) and embraces external fitness, i.e. how well the organisation adapts to the requirements of the environment in which it operates (Helfat *et al.*, 2007). In other words, sustained performance depends more on the

orchestration of organisational resources to fit the requirements of an unstable business ecosystem than on the traditional factors of success, such as cost control, quality management, or optimisation of inventories (Teece, 2007).

The DCM was developed for profit-oriented organisations, as evidenced by its goal of gaining a sustained competitive advantage that ensures market share and superior profitability (Teece, 2007). It is, however, argued that it can be equally applied to non-profit organisations because they also have to adapt their resource bases to manage change and complexity (Helfat *et al.*, 2007). Thus, four aspects of the DCM are highly relevant to this paper (and these will underpin the construction of the conceptual model in Section 6). First, its emphasis on timely responsiveness and adjustment of organisational resources (Teece and Pisano, 1994; Teece *et al.*, 1997; Teece, 2007) makes it relevant to the turbulent environment and challenges faced by humanitarian organisations. Indeed, a core component of humanitarian work is the need to continuously reconfigure operations in order to adapt to unpredictable and disruptive events, reduce their negative influence on performance, and effectively/efficiently deliver the relief items to the disaster-affected populations (Tomasini and Van Wassenhove, 2009; Hobbs *et al.*, 2012).

Second, the DCM is appropriate for studying the concept of agility in light of the three capabilities making up Teece's model, i.e. the capability to (1) sense environmental forces and changes, (2) seize opportunities by aligning resources, and (3) continuously adapt resources to overcome threats (Teece, 2007, 2009). These capabilities reflect not only the need to manage risks and uncertainties, but also to take advantage of opportunities (a key point that is developed later in the paper).

Third, the DCM emphasises the need for a systems view of the organisation. Whilst it is fully accepted that capabilities are embedded into operational processes, the underpinning idea of the DCM is that these capabilities transcend operational skills and are deeply inherent in strategic decision-making (Teece *et al.*, 1997; Eisenhardt and Martin, 2000; Teece, 2007). They are, therefore, fundamentally strategic (Teece, 2012) but, as the operational and strategic levels of capabilities are closely intertwined (Helfat *et al.*, 2007; Helfat and Winter, 2011), Teece (in his interview with Kleiner, 2013) further argues that an organisation must take a systems level perspective.

Fourth, the DCM distinguishes between capabilities and the 'micro-foundations' that support the development of such capabilities. 'Micro-foundations' are diverse and include organisational skills, processes, systems, decision rules, and structures (Teece, 2007, 2009). The distinction between these elements that underpin an organisation's capabilities and the capabilities themselves is important and will be used later in the development of the conceptual model of agility in the form of agility enablers and agility capabilities.

The next section follows on from the above theoretical insights and examines the contributions of the literature to the concept of agility in a business context.

4. Business disciplines' approach to agility

The literature on agility is well-established in various business disciplines and, in particular, in the fields of agile manufacturing, agile project management, agile supply chain management, and supply chain risk management. This section considers some relevant articles within these fields to understand how the literature in a business context is positioned in relation to the above-mentioned theoretical framework and the extent to which their contributions apply to the field of humanitarian logistics. In particular, this section deals with the major points addressed in the above-mentioned business disciplines, i.e. why agility is needed, how agility is approached, and what it takes to be an agile organisation.

4.1. Why is agility needed?

Risk and uncertainty exist in all business environments (Giunipero and Eltantawy, 2004) but, since businesses vary, the exposure to and the magnitude of risk/uncertainty differ from industry to industry (Rao and Goldsby, 2009; Sodhi *et al.*, 2012), as well as between the humanitarian and the commercial sectors (Metcalf *et al.*, 2011). Since the beginning of the 2000s, the literature on supply chain risk management has developed and the nature of the risks and uncertainties encountered by business organisations has been clearly identified (Tang, 2006; Rao and Goldsby, 2009) with supplier failure, reduced product life cycles, demand for more product variety, and changing customer requirements being examples of the risks/uncertainties generating supply chain disruptions in a business context (Swafford *et al.*, 2005). In practice, these are all supply chain-related risks and uncertainties, i.e. they are associated with supply, demand, and processes (Tang and Tomlin, 2008; Sodhi *et al.*, 2012). As pointed out by various authors (e.g. Christopher and Peck, 2004), these risks and uncertainties generate supply chain vulnerability and should be managed by building agility (Christopher and Towill, 2001). However, beyond these specific areas of risk/uncertainty, multiple macro-environmental factors exist that cannot be ignored, if only because the level of macro-environmental instability is considered by many authors to be increasing (e.g. Christopher and Holweg, 2011).

In the business and supply chain literature, various authors (e.g. DeLoach, 2000; Kleindorfer and Saad, 2005; Waters, 2007; Trkman and McCormack, 2009) consider the risks/uncertainties generated by the wider external environment. Going one step further, Christopher and Peck (2004) categorise risks into three categories: the risks internal to the firm, those external to the firm but internal to the supply network, and those external to the network. Authors studying the wider external risks mention, among other things, technology (Sodhi and Lee, 2007; Trkman and McCormack, 2009), terrorist and security issues (Kleindorfer and Saad, 2005; Peck, 2012), natural and technological disasters (Trkman and McCormack, 2009), competition (Manuj and Mentzer, 2008), political instability and changes in government policy (Rao and Goldsby, 2009), as well as market fluctuations (Rao and Goldsby, 2009; Sodhi and Tang, 2012) as sources of risk/uncertainty. Especially when addressing the concepts of supply chain vulnerability and resilience, academic authors (Peck, 2012; Wright, 2013), universities (Cranfield University, 2003), consultancy agencies

(Deloitte, 2012), and international organisations (World Economic Forum, 2012) discuss the impact of the macro-environment and external uncontrollable factors on logistics operations and the need for a comprehensive approach to supply chain risk management.

This approach to macro-environmental uncontrollable disruptions is relevant to humanitarian organisations because they operate in highly complex and dynamic field environments and their actions cannot be separated from the broader context. The wider external environment generates operational risk/uncertainty and negatively impacts on logistics operations by disrupting/interrupting the flow of humanitarian supplies. External factors (i.e. the socio-economic, physical, infrastructure, government, and security situational factors) greatly affect the nodes (e.g. ports or warehouses) and linkages (e.g. roads) along the humanitarian supply chains. These disruptions generate costs, limit access, constrain capacity, and lead to security issues (L'Hermite *et al.*, 2014). Be they predictable or sudden, the external risks/uncertainties cannot be easily removed or even mitigated because they come from external sources beyond the control of organisations (Trkman and McCormack, 2009) and in the context of increasingly complex and multi-dimensional humanitarian crises (Kent, 2011). Thus, like supply chain-related disruptions, external factors demand the capacity to continuously adapt and reconfigure logistics operations and, therefore, to build agility.

In summary, agility is needed in response to a wide range of risks/uncertainties and, in particular, internal, supply chain, and external ones. We now consider the extent to which a business-wide approach is needed to manage these risks and uncertainties.

4.2. *How is agility approached in the business disciplines?*

In the 1990s, the field of operations management moved from an operations-centred to a wider business approach in order to gain an in-depth understanding of the agile manufacturing enterprise (DeVor *et al.*, 1997). Thus, various academics explore how the strategic and operational levels of an organisation interact to build agility and enable shop-floor workers to carry out dynamic operations. For example, Goldman and Nagel (1993) argue that agile manufacturing is strategically focused (rather than operationally-focused) and, therefore, requires significant managerial input and responsibility, rather than solely being considered a technical or production responsibility. Likewise, Roth (1996) suggests that agile manufacturing should move from a shop floor-oriented approach to a macro-view based on combinative capabilities built at the corporate level. Along the same lines, Vázquez-Bustelo *et al.* (2007) establish relationships between strategic assets owned by agile organisations (agile human resources, value chain integration, concurrent engineering, agile technologies, and knowledge management) and manufacturing performance.

Similar multi-level approaches can be found in other disciplines. For example, it has been recognised in the broader strategic management literature that agility must encompass all levels of an organisation, and that its development and maintenance require leadership and management commitment (McCann and Selsky, 2012). Similarly, in the field of software development, Appelo (2011) and Cobb (2011) assert that there are different levels of agility and that agile practices cannot be adopted without executive and senior management action.

Taking this strategic perspective further, Appelo (2011) argues that leaders and managers have the responsibility to develop an agile system, to protect this system, and to direct it (i.e. to articulate a shared purpose and direction). By doing so, leaders and managers ensure that the organisation is able to maintain a sustained level of performance even when adapting to risk, uncertainty, and changes.

One particular agile methodology in the field of software development, Scrum, has merit because it highlights the necessary interface between the different levels of an organisation in order to solve complex adaptive problems (Schwaber and Sutherland, 2013). In particular, the Scrum framework defines the main roles and responsibilities within the organisation and differentiates between those of the 'Team' (i.e. the technical level) and those of the 'ScrumMaster' (who acts both as a leader and a servant for the Team). A Team is self-governing, i.e. it is empowered to organise and manage its own work. Thus, the operational level of the organisation knows what has to be done, and also how to do it well by adapting methodologies and making them fit the requirements of the environment. On the other hand, the ScrumMaster is not only in charge of ensuring that the Team understands what has to be achieved at the operational level, but also he/she acts as a facilitator. Thus, the ScrumMaster facilitates and coordinates the work of the Team, and protects it from external interference and hindrances that prevent it from operating properly (Schwaber, 2004). The key message that the Scrum methodology conveys in the context of this paper is that agility is built with the support of the leadership/management level and, therefore, requires a multi-level approach.

The relevance of this multi-level approach to humanitarian logistics is best illustrated by an example compiled from actual situations encountered in the field by the United Nations World Food Programme (WFP) (WFP, 2012a, 2013b; d; f). When heavy rains are forecast to make roads impassable, a humanitarian organisation can recognise the threat (the lack of access to those in need) and, consequently, stockpile supplies at the point of delivery before the rainy season. This illustrates the redundancy-based approach to risk management mentioned in Section 2. Instead of (or in addition to) building buffer stock, the organisation can decide to switch transport from road to barge because the water levels in the rivers make access by barge possible. In doing so, the organisation is able to increase its efficiency because greater volumes of supplies are delivered more quickly by using barges. However, to reconfigure the delivery process, the support of the strategic level of the organisation is essential. For example, the organisation needs decentralised authority to address risks and uncertainties (i.e. field workers are empowered to make rapid and informed decisions), appropriate skills and expertise (e.g. field workers have a good knowledge of the field conditions, make good local contacts with barge owners, etc.), and the required staff attitude (problem-solving, creative, and able to recognise an opportunity).

If transporting the humanitarian supplies by barge is not possible, the organisation can make the decision to mobilise a fleet of heavy-duty vehicles (able to pass along the muddy roads), together with a team of mechanics and the spare parts needed for maintenance and repairs. In the same way as in the previous instance, the support of the strategic level of the organisation is critical, i.e. developing capacity (owning, or access to, a fleet of vehicles), making information regarding resource availability accessible, and building an appropriate

organisational structure. The structural arrangements not only involve a dedicated fleet team whose skills and expertise make it possible to swiftly set up a fleet hub in an adverse environment, but also the facilitation of cooperation between the different entities within the organisation (e.g. between the country office and the fleet team).

This example demonstrates that agility transcends operations. Agility not only reflects the flexibility and responsiveness of the operational level, but also the support provided by the strategic level of the organisation in order to remove as much risk and uncertainty as possible from the operational level and make it operate effectively and efficiently (Schwaber, 2004; Appelo, 2011). This example also shows that agility is not only about overcoming threats. As mentioned previously in the discussion regarding the DCM literature, the concept is also about seizing opportunities (in the example, to increase efficiency by delivering higher volumes of supplies more rapidly by using barges).

The investigations presented in this sub-section clearly demonstrate that achieving agility involves decisions and responsibilities at multiple levels. After having established that agility requires a systems approach, it is now necessary to determine how agility is created, i.e. what it takes to be an agile organisation.

4.3. What does it take to be an agile organisation?

Based on the DCM approach, this sub-section aims to identify the strategic level agility capabilities as well as the ‘micro-foundations’ underlying agility (Teece, 2007, 2009). The ‘micro-foundations’ are called agility enablers in this paper.

4.3.1. Strategic level agility capabilities

From the broader management literature, four strategic level agility capabilities can be identified. These are (1) being purposeful, (2) being action-focused, (3) being collaborative, and (4) being learning-oriented. Whilst this framework is mainly derived from McCann and Selsky’s (2012) work, the contributions of additional authors are also considered.

First, an organisation is purposeful when it has a clear direction for action that drives meaningful results throughout the whole organisation (Drucker, 1994; McCann and Selsky, 2012). Second, an organisation is action-focused when it proactively and reactively manages risks and opportunities to fulfil this purpose (McCann and Selsky, 2012). Thus, these two first capabilities are about building a shared vision and a constant state of readiness in order to ensure that staff are able to recognise and respond swiftly and successfully to turbulence (Redding and Catalanello, 1994).

The third agility capability, that of being collaborative, relates to the building and sustaining of valued internal and external relationship networks in order to solve problems and achieve common outcomes collaboratively (McCann and Selsky, 2012). Fourth, being learning-oriented means that an organisation systematically and critically evaluates practices and

processes in order to raise its capacity to continuously adapt and transform in response to turbulent environments (Redding and Catalanello, 1994). Several authors (see Bowles, 2004) argue that agility stems from the creation of continuous learning processes, i.e. considering, at the strategic level of the organisation, what is being done at the operational level, and improving future planning accordingly.

The above-mentioned four capabilities are perceived to be the dynamic capabilities that a humanitarian organisation should build at the strategic level in order to elevate its capacity to respond to the rapid changes encountered in the field and that prevent uninterrupted logistics and supply chain operations. The relevance of these four capabilities to the field of humanitarian logistics is established in the literature (albeit not in direct relation to the concept of agility). Thus, several authors mention that humanitarian organisations are purposeful organisations acting to fulfil a clear mandate, i.e. saving lives (e.g. Beamon and Balcik, 2008; Tomasini and Van Wassenhove, 2009). Similarly, Maon *et al.* (2009) argue that, in the humanitarian sector, action is typically supported by a value-driven culture and strong commitment to the organisational purpose.

The strategic inputs enabling an organisation to be action-focused are also addressed in the humanitarian context. For example, according to Seal and Bailey (2013), building readiness and supporting timely action requires, among other things, a physical local presence as well as the availability of sufficient human, material, and financial resources. Along the same lines, Gatignon *et al.* (2010) demonstrate that decentralising logistics operations enables rapid responses when supported by standard logistics processes, appropriate information systems, and adequate skills.

The importance of collaboration is widely studied in the humanitarian logistics literature because responding to a disaster inevitably goes beyond the capacity of a single organisation (Thomas and Kopczak, 2005). Thus, Balcik *et al.* (2010) argue that both vertical (among supply chain partners) and horizontal coordination (among different relief actors) contribute to reducing the response time and to deploying humanitarian supplies more rapidly. Further authors studying the benefits of collaboration in humanitarian logistics include Thomas and Fritz (2006) (partnerships between humanitarian and commercial organisations), Schulz (2008) (horizontal cooperation between humanitarian organisations), and Jahre and Jensen (2010) (cluster coordination).

The relevance to the humanitarian context of the last agility capability, i.e. being learning-oriented, is also covered by a number of authors (e.g. Tatham and Spens, 2011; Lu *et al.*, 2013). In particular, Tomasini and Van Wassenhove (2009) explain that sharing the lessons learned prevents humanitarian organisations from reinventing the wheel and, thus, enables them to make faster and better decisions. Similarly, HAP (2013) argues that learning from past experiences and translating the lessons learned into improved actions contribute to continuously improving humanitarian interventions.

4.3.2. Agility enablers

As mentioned earlier, the DCM distinguishes between capabilities and the ‘micro-foundations’ that underpin those capabilities (Teece, 2007, 2009). Following this lead, we argue that the four above-mentioned capabilities (being purposeful, action-focused, collaborative, and learning-oriented) cannot be developed without the deployment of organisational resources and, in particular, people, processes, and technology. The commonly accepted people-process-technology framework used in a range of management areas has been chosen as it reflects the work of a number of authors on the DCM (such as Teece (2007, 2009)) and on agility (such as Sharifi and Zhang (2001) and Gattorna (2006)). We call people, processes, and technology the three agility enablers.

The first agility enabler emphasises the role of people in achieving agility, as considered by Sherehiy *et al.* (2007) who review the literature regarding workforce agility. Among other things, an agile workforce is experienced, multi-skilled, adaptable, technologically savvy, team-oriented, able to handle uncertainty and stress, as well as proactive and creative in dealing with threats and opportunities. For Maskell (2001), agility comes from educated and trained people who understand the organisation’s vision and have the authority to make decisions to fulfil it. Similarly, Cockburn (2007) and Appelo (2011) argue that people are the agents of agility since their knowledge, creativity, motivation, diversity, and personality are at the root of innovation and agility.

Second, the ‘process’ element should be understood as reflecting the way an organisation establishes structures and systems to achieve its core purpose. ‘Process’, therefore, relates to the definition of roles, the location of authority, relationships, as well as communication. According to the detailed discussion to be found in Sherehiy *et al.* (2007), an agile organisation has not only an organic team-based structure that is able to rapidly respond to change, but it also promotes internal differentiation (the specialisation of different parts of the organisation). The authors also mention coordinating mechanisms between functions and units, clarity of purpose, open communication, and distributed decision-making as further organisational agility facilitators. This echoes Appelo’s (2011) and Cobb’s (2011) views of the structure of an agile organisation which should be made of self-organised and empowered teams with different roles and constant interactions with each other to increase cross-functional synergies.

Third, technology as an agility enabler has been widely studied in the operations management literature. For example, Gunasekaran (1999) highlights the integrating and coordinating role of information technology, and Kidd (1994) observes how technology enables organisations to leverage skills and knowledge. The impact of technology on agility has also been analysed within the supply chain discipline. For example, Christopher and Lee (2004) explain that information technology improves supply chain confidence and, thus, increases market sensitivity (organisations become demand-driven and respond to the actual customer demand), creates virtual supply chains (instead of inventory-based supply chains), promotes relationships, and facilitates process integration across the supply network (Christopher, 2000, 2011). Similarly, Power *et al.* (2001) observe that computer-based technology facilitates supply chain agility and promotes better operational outcomes.

A number of authors have demonstrated the relevance of these three agility enablers to humanitarian logistics. Thus, the importance of people and human capacity building, and, in particular, the importance of the right level of technical, managerial, and personal skills in humanitarian logistics have been widely covered (e.g. Thomas and Mizushima, 2005; Whiting and Ayala-Öström, 2009; Kovács *et al.*, 2012; Allen *et al.*, 2013). In addition, well-established processes have been recognised as essential to the optimisation of humanitarian logistics operations and the ability of humanitarian organisations to achieve service quality and timely deliveries (Blecken, 2010c; Logistics Cluster, 2013c; Buddas, 2014; Larson, 2014). The positive role of technology in humanitarian logistics and, in particular, information technology, has also been extensively addressed in prior research. For example, Scholten *et al.* (2010) argue that information technology is an essential component of agility. This is because technology improves the accuracy and timeliness of the flow of information, fosters supply chain integration, supports decision making, and accelerates the deployment of resources (Howden, 2009; Pettit and Beresford, 2009; Blansjaar and Stephens, 2014).

It follows from these discussions that the four agility capabilities and the three agility enablers play an essential role in the building of agility. However, individually, none of these elements is sufficient. They are collective providers of agility requiring a systems approach but, taken separately, they do not represent agility (Dove, 1996). The elements developed in this section will guide the building of the conceptual model and the exploration of possible areas of research later in the paper. Before doing so, the next section reviews the humanitarian logistics literature on agility and identifies research gaps based on the business disciplines' contributions as discussed above.

5. Research gaps in the current humanitarian logistics literature

The humanitarian logistics literature was searched to identify the studies relevant to agility and consider them in light of the above discussions. In addition to the small number of books dedicated to humanitarian logistics, peer-reviewed articles were sought using the abstract search of the ProQuest, Business Source Premier, and SciVerse Scopus databases with the following keywords and Boolean operators:

- "*humanitarian logistics*" OR "*humanitarian supply chain**" OR "*humanitarian action*" OR "*humanitarian aid*" OR "*humanitarian assistance*" OR "*humanitarian relief*" OR "*disaster relief*"

AND

- "*agility*" OR "*flexibility*" OR "*responsiveness*".

The first set of key words reflect those used in the main literature reviews conducted in the field of humanitarian logistics (i.e. Kovács and Spens, 2007; Overstreet *et al.*, 2011; Kunz and Reiner, 2012; Leiras *et al.*, 2014). In addition, it should be noted that, in this paper, agility, flexibility, and responsiveness are not seen as interchangeable (as mentioned earlier, flexibility and responsiveness are the operational components of agility). However, as the

terms agility, flexibility, and responsiveness are sometimes used interchangeably in the literature (Li *et al.*, 2008), they were brought together in the database search in order to not overlook any relevant study. Next, the HUMLOG bibliography developed by Professor Peter Tatham (HUMLOG, 2015) and which provides an extensive list of journal articles, book chapters, and conference papers relating to the field of humanitarian logistics was perused. As shown in Table 1, a total of thirty-four documents were identified.

Search method	Number of documents identified	Cumulative number of documents (not previously identified)	Number of relevant documents identified	Cumulative number of relevant documents (not previously identified)
Database search	ProQuest Business: 10 hits	10	3	3
	Business Source Premier: 9 hits	13 (+3)	1	3 (+0)
	SciVerse Scopus: 18 hits	25 (+12)	2	3 (+0)
Book search (5 books)	2	27 (+2)	2	5 (+2)
HUMLOG bibliography	11	34 (+7)	5	7 (+2)

Table 1: Literature search process

These thirty-four documents were considered individually and only those providing an insight on the way that the concept of agility is studied in the humanitarian logistics context were selected. To do so, the title and abstract of each document were examined and any irrelevant material excluded. The documents whose titles and abstracts were not sufficient to assess relevance were read in full. This process generated a list of seven relevant studies (five academic papers and two book chapters) that are presented in Table 2.

These documents are now reviewed based on Section 4's discussions in order to identify why agility is needed in humanitarian logistics and how the concept of agility is currently approached in this discipline.

Authors	Journal/Book	Purposes of the study	Contents/Results
Charles <i>et al.</i> (2010)	<i>International Journal of Physical Distribution & Logistics Management</i>	Developing a framework for defining agility as well as a model for measuring agility	The paper proposes: 1) A framework (the 'house of supply chain agility') identifying the elements making up the concept of agility (i.e. effectiveness, responsiveness, and flexibility) as well as their respective capabilities. 2) An assessment model using metrics and evaluation grids to measure the various capabilities included in the 'house of supply chain agility' and to identify potential areas of improvement.
Cozzolino <i>et al.</i> (2012)	<i>Journal of Humanitarian Logistics and Supply Chain Management</i>	Identifying stages in the humanitarian process in which agile and lean principles are needed	The paper demonstrates that agile and lean principles are applied at different stages of the disaster relief process, i.e. agile principles are needed in the emergency (immediate response) phase to achieve effectiveness, whereas lean principles can be considered in the reconstruction phase to achieve efficiency.
Kovács and Tatham (2009)	<i>Journal of Business Logistics</i>	Examining the resource configurations of humanitarian vs. military organisations	In relation to agility, the paper shows that humanitarian organisations prepare for emergencies and, consequently, increase their agility and effectiveness by configuring physical capital resources (e.g. pre-positioned inventory and framework agreements with suppliers), human capital resources (e.g. rosters), organisational capital resources (e.g. local presence), and organisational external resources (e.g. relationships with donors or NGOs).
Oloruntoba and Gray (2006)	<i>Supply Chain Management</i>	Investigating the relevance of supply chain agility to the field of humanitarian aid	The paper highlights the relevance of the concept of agility in humanitarian aid in relation to funding uncertainties and shows that the principle of postponement can be applied to humanitarian supply chains and can be used instead of prepositioning supplies.
Scholten <i>et al.</i> (2010)	<i>International Journal of Physical Distribution & Logistics Management</i>	Exploring the concept of agility in the humanitarian supply chain context	The paper provides indications that humanitarian supply chains are flexible but NGOs need to do more to fully adopt the critical elements of agility (and, in particular, technology) in order to achieve the full benefits of agility in terms of efficiency and effectiveness.
Tatham and Christopher (2014, pp. 1-18)	<i>Humanitarian logistics</i>	Applying business agility concepts to the humanitarian context	The book chapter shows that: 1) The four characteristics exhibited by agile organisations (demand- and event-driven, networked-based, process-oriented, and virtually-integrated) are relevant to humanitarian organisations. 2) Agility requires coordination, information sharing, and interoperability.
Tomasini and Van Wassenhove (2009, pp. 58-64)	<i>Humanitarian logistics</i>	Studying the building blocks of preparedness driving the development of a Triple-A supply chain (Agile, Adaptable, Aligned)	The two book paragraphs show that achieving a Triple-A supply chain goes beyond logistics and requires a broader preparedness strategy based on five elements (human resources, knowledge management, logistics, finance, community) as well as inputs at various levels of the organisation.

Table 2: Humanitarian logistics literature addressing the concept of agility

5.1. Why is agility needed in humanitarian logistics?

First, the documents are reviewed in order to identify the nature of the operational risks and uncertainties that justify the building of agility. Although the broader humanitarian logistics literature widely covers the highly disruptive environment in which humanitarian organisations operate (see Kunz and Reiner, 2012), the studies in Table 2 mostly limit agility to supply chain-related risks and uncertainties. For example, Cozzolino *et al.* (2012) use Christopher's (2005) model of agile vs. lean supply chains and, on this basis, consider agility as a response to unpredictable demand and short lead times. In other words, they study agility only in response to supply chain risks and uncertainties and not in response to contextual factors external to the supply chain. Similarly, although they mention that humanitarian organisations operate in unstable external environments, Charles *et al.*'s (2010) agile capabilities and metrics are predominantly derived from the manufacturing environment and, therefore, mainly address risks and uncertainties in relation to demand, supply, and processes. This perspective is also found in Scholten *et al.* (2010) where the constraints mentioned relate to unanticipated demand, the uncertainty of supply, and the lack of process integration. Going one step further, we note that none of the documents listed in Table 2 clearly categorises the risks/uncertainties encountered by humanitarian organisations and that require them to build agile supply chains. Thus, it appears that there is still a need for understanding and categorising all risks/uncertainties that justify the building of agility in humanitarian logistics (i.e. beyond the supply chain-related risks and uncertainties).

5.2. How is agility approached in humanitarian logistics?

Next, Table 2's documents are reviewed to ascertain the organisational level at which agility is being studied (operational and/or strategic), as well as to determine if the strategic mechanisms of agility are identified. In the first document of Table 2, Charles *et al.* (2010) develop a model to measure the agility of humanitarian and commercial supply chains. To this end, they identify the main components of agility (i.e. effectiveness, responsiveness, and flexibility) as well as the capabilities and metrics associated with these components. However, these capabilities cannot be seen as dynamic capabilities because they are primarily operational (e.g. volume flexibility, delivery flexibility, completeness, velocity, etc.). In other words, Charles *et al.* (2010) do not identify the strategic level capabilities needed to support supply chain agility. Similarly, Cozzolino *et al.*'s (2012) analysis of agility is operationally-focused. For example, these authors associate agility with the building of redundant operational capacity, the rapid mobilisation of air transport, and the swift deployment of an emergency team of IT, telecommunication, and electricity specialists. Oloruntoba and Gray's (2006) study of the applicability of the concept of postponement in a humanitarian context is also focused on operations. In particular, these researchers highlight the potential of postponement as an improved means of responding to the actual demand of beneficiaries and increasing flexibility in the field.

Taking a different view, Tatham and Christopher (2014) argue that agile organisations (commercial or humanitarian) exhibit four characteristics, i.e. they should be demand- and

event-driven, network-based, process-oriented, and virtually integrated. Whilst these characteristics clearly require a business-wide approach to the concept of agility, the authors do not go as far as recognising agility in humanitarian logistics as fundamentally strategic and they do not explain how humanitarian organisations achieve the four characteristics. In the same way, Scholten *et al.* (2010) argue that agility goes beyond operational flexibility and that humanitarian organisations can do more to fully adopt the most beneficial elements of agility (which these authors state to be market sensitivity, virtual integration, process integration, and network integration). In particular, they highlight the essential role of technology to achieve agility. This implies, arguably, that agility requires strategic inputs but the authors do not explicitly take up this position. Tomasini and Van Wassenhove (2009) touch upon the need for an integrated and organisational approach to supply chain agility when they explain that a ‘Triple-A’ supply chain (i.e. Agile, Adaptable, and Aligned) requires strategic inputs in terms of human resources, knowledge management, logistics, finance, and community. However, Tomasini and Van Wassenhove (2009) only briefly mention this approach at the end of their book chapter which is focused on preparedness. In addition, their analysis does not extend to the capabilities needed to deploy the five mentioned enablers. Similarly, Kovács and Tatham (2009) show that agility stems from the humanitarian organisations’ ability to configure their available resources and, in particular, their physical, human, capital, and external organisational resources in order to swiftly respond to emergencies. However, as in the previous instance, they do not identify the set of capabilities needed to deploy these resources.

Thus, the primary focus of the humanitarian logistics literature relating to agility remains firmly rooted in operational level considerations. This does not mean that the various authors see the strategic level as insignificant but, to date, the way and the extent to which managerial and leadership decisions and practices contribute to logistics and supply chain agility in a humanitarian context have not been studied. These elements are considered in the model of agility presented in the next section.

6. Alternative approach to agility in humanitarian logistics

The following conceptual model of agility has been developed by using the previous discussions regarding the encountered risks and uncertainties impacting on logistics and supply chain activities (Section 4.1), the need to consider agility at the operational and at the strategic level (Section 4.2), and the four strategic level agility capabilities supported by three agility enablers (Section 4.3). In addition, four aspects of the DCM are reflected in the model. First, the model shows that agility is not only a response to arising risks and uncertainties, but also to emerging opportunities. Second, the model includes four dynamic capabilities that go beyond operational skills, are deeply inherent in strategic decision-making, and enable an organisation to adapt to the requirements of an unstable environment. Third, the model distinguishes between the actual capabilities and the enablers that support the development of the capabilities (also called ‘micro-foundations’ by Teece). Fourth, the model takes a systems view of the concept of agility and shows that the operational and strategic levels of the organisation must interact to create agility.

Thus, Figure 2 includes four distinct elements:

- Agility drivers,
- Responsive and flexible humanitarian logistics operations,
- Agility enablers,
- Strategic level agility capabilities.

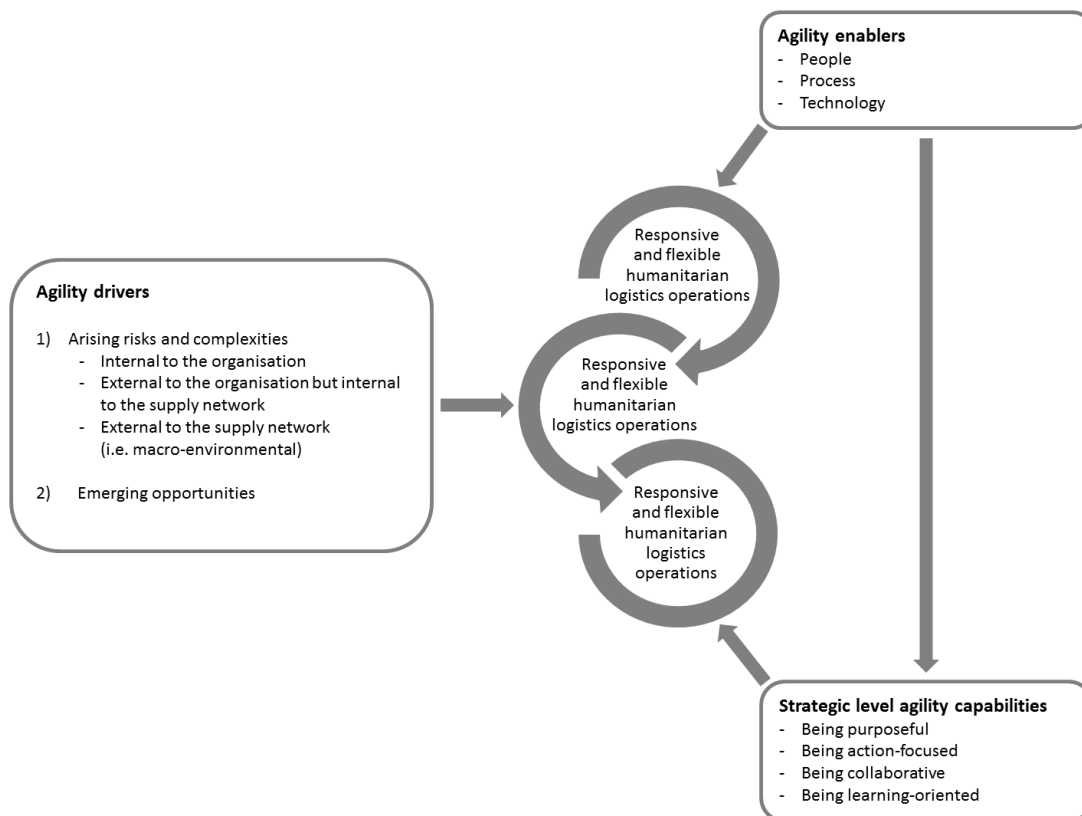


Figure 2: Conceptual model of agility in a humanitarian logistics context

The agility drivers are those forces that push an organisation to respond (Sharifi and Zhang, 2001). Figure 2 identifies two types of agility drivers, i.e. risks and opportunities. Christopher and Peck's (2004) categorisation of risks (discussed earlier) has been integrated into the model because it demonstrates that risk and uncertainty are not only generated within the organisation and the supply network, but also by the turbulence created by the macro-environment (as mentioned earlier, a point that is particularly relevant in the humanitarian context). As further illustrated in Figure 2, agility drivers make continuous adaptation and reconfiguration of the humanitarian logistics and supply chain operations necessary. In other words, to appropriately respond to the agility drivers, humanitarian logistics operations need to be flexible and responsive. This cannot be fully achieved without taking a systems level view, i.e. without the whole organisation developing agility

capabilities (Sharifi and Zhang, 2001). Therefore, the model integrates the four strategic level agility capabilities identified earlier, namely being purposeful, action-focused, collaborative, and learning-oriented. Agility capabilities are built by deploying the associated agility enablers which consist of people, processes, and technology. Thus, the model summarises why an organisation needs to build agility (the agility drivers) and how it should pursue agility by deploying agility enablers in order to build strategic level capabilities that support responsive and flexible operations.

In order to better elucidate how the strategic level agility capabilities are built by deploying the agility enablers, Table 3 describes the agility capabilities at four different levels of an organisation (individual, team, strategic, and supply network) by drawing on the research conducted by Redding and Catalanello (1994) and by McCann and Selsky (2012).

This table illustrates how people, processes, and technology underpin the development of the agility capabilities. For example, and in relation to the field of humanitarian logistics, the individual and team levels show that managers and leaders have a role to play in the recruitment and the development of people in order to make them able to meet the requirements of the field (Kovács *et al.*, 2012), i.e. to make them purposeful, action-focused, collaborative, and learning-oriented. Whilst being important at all levels, processes play a significant role at the operational level of a humanitarian organisation and must be appropriately developed and deployed by leaders and managers. They not only support more effective decision making and make the organisation an action-focused organisation (Blecken, 2010c; Larson, 2014), but they also enable the organisation to capture and share the lessons from the field (thereby making the organisation learning-oriented) (HAP, 2013). Technology is also essential at all levels. For example, technology can support individual learning (e.g. e-learning) (Blansjaar and Stephens, 2014) as well as communication throughout the organisation and with entities outside the organisation (Balcik *et al.*, 2010; Scholten *et al.*, 2010) in order to make it action-focused and collaborative.

Thus, Table 3 reflects the decision space for leaders and managers, and emphasises that an organisation builds agility in all directions, i.e. downwards, upwards and around (McCann and Selsky, 2012). As a consequence, the strategic level of an organisation needs to take a systemic perspective, i.e. consider how the parts of the system interrelate (Senge, 2006), how to configure and reconfigure these elements to fit the requirements of the environment, and how to build agility at all four levels concurrently (individual, team, organisation, and supply network) and in an aligned way (Redding and Catalanello, 1994; McCann and Selsky, 2012). Importantly, and as will be mentioned in the next section, Table 3 has been developed to operationalise the model of agility and, therefore, can be used to further investigate the mechanisms of agility building, i.e. to understand how logistics and supply chain agility is supported by the development of capabilities at the four levels and by their interactions.

	Individual	Team	Strategic	Supply network
Purposeful Maintaining a clear direction for action	The individual identifies with the core values and beliefs of the organisation, even in high stress situations	The operational team fully understands the operational objectives, and works towards their achievement	The organisation vividly and frequently instils a clear sense of common purpose and aligns goals and objectives across the organisation with this guiding purpose	A shared purpose contributes to co-orientation of action across partners in the supply network
Action-focused Proactively or reactively managing risks and opportunities	The individual is competent and confident in taking action	The operational team is mindful of the forces impacting on field operations and adapts its way of working accordingly	The organisation makes the appropriate tools and resources (design, processes, expertise, funds, equipment, information) available for decision making and quick action	Rapid action is supported by active information sharing and by the removal of barriers to action across partners in the supply network
Collaborative Maintaining a network of valued relationships to solve problems collaboratively	The individual maintains positive and active personal relationships within and outside the organisation	The operational team actively collaborates with other teams/units/departments within and outside the organisation	The organisation supports the building of trust and relationships within and outside the organisation	Relationships are actively and collectively maintained, and supported across organisations
Learning-oriented Critically evaluating practices to continuously improve them	The individual is committed to active learning, self-development, and the development of others	The operational team learns from continuously adjusting operations, reflects on these lessons, and transfers the knowledge to the higher level	The organisation encourages the reporting of successes and failures, captures and shares the lessons identified, and supports continuous improvement	All supply network partners support cross-organisational learning and adopt a retrospective approach by reflecting on past experiences and incorporating them into new practices

Table 3: The agility capabilities across levels (adapted from McCann and Selsky, 2012)

7. Research agenda

Moving forward from the above discussions, it is argued that the concept of agility in a humanitarian logistics context is currently incomplete. Three research directions are, therefore, suggested. First, research should be undertaken to gain a better understanding of the agility drivers and, in particular, the risks and uncertainties encountered by humanitarian organisations. This paper mentions four types of risks/uncertainties (demand-, supply-, process-related, and environmental) classified into three categories (those internal to the organisation, those external to the organisation but internal to the supply network, and those external to the supply network). However, further investigations are needed to validate this approach and, in particular, to determine the nature and the frequency of the risks encountered, as well as to accurately identify, categorise, and analyse the severity of their impacts on the logistics activities of humanitarian organisations. Thus, Christopher and Peck's (2004) model introduced earlier can be used as a starting point to better understand the risk environment in which humanitarian organisations operate and that justify the building of agility. Going one step further, research should also focus on the risks and uncertainties applicable to different categories of disaster situations and operational environments (L'Hermitte *et al.*, 2014). In summary, the following research questions remain to be addressed:

- RQ1. What is the nature of the risks/uncertainties encountered by humanitarian organisations that justify the need for agility?
- RQ2. What is the frequency of occurrence of these risks/uncertainties?
- RQ3. What are the potential impacts of these risks/uncertainties on logistics operations?
- RQ4. How severe are the impacts of these risks/uncertainties on logistics operations?
- RQ5. Are the risks/uncertainties encountered by humanitarian organisations different according to the nature of the disaster environment in which they operate?

Second, given that agility is not a quick fix (Cobb, 2011) but an integrated system (Gunasekaran, 1998; Sanchez and Nagi, 2001), humanitarian organisations should understand what it takes to be able to conduct agile operations in their particular context. This paper argues that operating in a continuously changing and unpredictable environment is a challenge that involves not only the operational level, but the organisation as a whole. In other words, supply chain agility requires a strategic approach. As the humanitarian logistics literature does not provide any multi-level analysis of the concept of agility, research efforts should focus on exploring how the strategic and operational levels of an organisation interact to create logistics and supply chain agility. In particular, research is needed to determine how, in a concrete sense, humanitarian organisations create agility by deploying agility enablers and building capabilities to support field operations. In relation to the model presented in Figure 2, these investigations relate to the agility enablers and strategic level agility capabilities. To do so, researchers could usefully employ Table 3 that was developed to understand how the agility enablers contribute to the building of the strategic level agility capabilities. This table describes the four agility capabilities (being purposeful, action-focused, collaborative, and learning-oriented) at four different levels (individual, team, strategic, and supply network) in order to understand how these elements interact to create agility. The development of scale items to measure the agility capabilities at the four

different levels as well as a statistical technique (such as a factor analysis) could be used to investigate these issues. In doing so, academic research will be able to provide practical and actionable prescriptions for humanitarian organisations. In summary, the following research questions remain to be addressed:

- RQ6. How do the individual, team, strategic, and supply network levels of an organisation interact to build agility capabilities?
- RQ7. How do the strategic level agility capabilities correlate to each other to create agility?

Third, it is contended that the development of strategic level agility capabilities is not an end in itself, but a means to achieve flexibility and responsiveness in the field in order to prevent the ongoing exposure to highly disruptive events from negatively impacting on performance (Weick and Sutcliffe, 2001). Therefore, empirical research should be conducted to study the impact of developing strategic level agility capabilities on operational flexibility and responsiveness. In relation to Figure 2's model, these investigations relate to the impact of the strategic level capabilities on the responsive and flexible operations represented at the centre of the model. These relationships can be explored by drawing on prior research conducted, for example, in the fields of agile manufacturing (Vázquez-Bustelo *et al.*, 2007; Hallgren and Olhager, 2009) or agile supply chain management (Gligor and Holcomb, 2012a; Whitten *et al.*, 2012). In particular, a statistical technique such as structural equation modelling could be used to test the structural relationships between variables and, thus, address the following research questions:

- RQ8. What are the structural relationships between the four strategic level agility capabilities and the responsiveness of humanitarian logistics and supply chain operations?
- RQ9. What are the structural relationships between the four strategic level agility capabilities and the flexibility of humanitarian logistics and supply chain operations?

8. Value and limitations

This paper is designed to bring new insights into the concept of agility in the field of humanitarian logistics and to provide a more comprehensive framework for analysing agility in this context. In particular, it is argued that limiting agility to the operational level is suboptimal and that widening the scope of the concept is valuable as a means of gaining a better understanding of agility. To achieve this, the paper identifies a number of relevant components and their conceptual relationships. In particular, it integrates the notions of agility drivers, responsive and flexible operations, strategic level agility capabilities, and agility enablers into a single model. This model is the main contribution of the paper. It not only offers potential for future research, but also provides the basis for a practical approach to agility in humanitarian logistics. It is, thus, a step towards an improved understanding of the nature of the strategic decisions that humanitarian organisations might take to improve their supply chain agility. In particular, this paper intends to help managers and leaders

understand that agility goes beyond the prepositioning of supplies, the swift deployment of a team of specialists, or the rapid organisation of airdrops to deliver humanitarian supplies to remote and unstable locations. Whilst these elements, undoubtedly, contribute to supply chain agility, we argue that they are not sufficient and that managerial and leadership input is also necessary. This includes, for example, the understanding of the problems encountered at the field level, the recognition of the skills and tools needed to overcome these problems, the achievement of the right balance between the need for formal processes and procedures that enhance responsiveness and decentralised initiative that fosters flexibility, the assessment of the current internal abilities (as well as the gaps), and the development of strategies to quickly and appropriately fill the gaps (for example through training or the development of collaborative networks).

However, given that this paper is conceptual in nature, the relevance of the approach and the model need to be scientifically and empirically tested. In addition, a number of issues remain to be explored, as explained in detail in the previous section.

9. Summary

This paper reflects on the concept of agility in the humanitarian context. It argues that the current ways of addressing agility in the humanitarian logistics literature are incomplete and proposes a more comprehensive definition and picture of the concept. Drawing on the DCM and following the lead of researchers in other disciplines, the chosen approach goes beyond operational agility to embrace a multi-level perspective in which the strategic and operational levels of the organisation interact in order to manage disruptive events appropriately. The paper identifies three research gaps in the current humanitarian logistics literature. They relate to the types of risks/uncertainties that justify the building of agility (not only demand-, supply-, and process-oriented risks/uncertainties, but also contextual ones), the need to approach agility as a system (i.e. from a strategic and operational perspective), and the identification of the strategic components of agility. These gaps are partially addressed by conceptualising a comprehensive model of agility in a humanitarian logistics context. This model suggests that agility enablers and strategic level capabilities support responsiveness and flexibility at the operational level in response to agility drivers (i.e. risks and opportunities). Since this paper is conceptual in nature, empirical research is needed to validate this approach. To this end, a research agenda is proposed.

6.4. Paper IV

DEVELOPING ORGANISATIONAL CAPABILITIES TO SUPPORT AGILITY IN HUMANITARIAN LOGISTICS: AN EXPLORATORY STUDY

Cécile L'Hermitte

Australian Maritime College, University of Tasmania

Peter Tatham

Department of International Business and Asian Studies, Griffith Business School

Marcus Bowles

Australian Maritime College, University of Tasmania

Benjamin Brooks

Australian Maritime College, University of Tasmania

Abstract

Purpose - This paper aims to explore the underlying strategic mechanisms of agility in a humanitarian logistics context. Based on the research conducted in business disciplines, the paper empirically examines a set of four strategic dimensions (being purposeful, being action-focused, being collaborative, and being learning-oriented) and identifies an emergent relationship between these capabilities and agile humanitarian logistics operations.

Design/methodology/approach - Leadership and management actions perceived to support the four capabilities were identified and used as a basis to complete the exploratory research. Specifically, a case study with the United Nations World Food Programme (WFP) was undertaken and, in this context, a qualitative analysis of 29 face-to-face interviews with humanitarian logistics experts working for WFP was conducted.

Findings - Our research corroborates the relevance of the four strategic level capabilities to the humanitarian logistics context and confirms that these capabilities play a role in the development of agility in humanitarian operations. Our work also identifies a set of key strategic decision making areas that relate to the building of agility.

Research limitations/implications - Additional research is needed to further investigate and measure the strategic level capabilities and to quantify their impact on operational agility. Further research should also be undertaken to extend this study to a wider range of humanitarian organisations.

Originality/value - This paper is the first empirical research that takes a strategic approach to the concept of agility in humanitarian logistics. It highlights that the leaders and managers of humanitarian organisations have a significant role to play in the building of an agile system.

Keywords - Humanitarian logistics; Humanitarian supply chain; Agility; Agile capabilities; Strategic capabilities; Capacity building

Article classification - Research paper

1. Introduction

Humanitarian organisations typically operate in highly complex, dynamic, and uncertain environments (Van Wassenhove, 2006). In a supply chain context, these uncertainties relate not only to unpredictable and changing demand and supply patterns (Balcik and Beamon, 2008; Charles *et al.*, 2010), but also to the many contextual factors that interrupt, or at least disrupt, the flow of humanitarian supplies. Such contextual factors include the lack and/or destruction of the logistics infrastructure, communication challenges, the inadequacy of the logistics resources available locally (e.g. for storage and transport), weather-related disruptions, as well as insecure and corrupt environments (Tatham and Pettit, 2010; L'Hermitte *et al.*, 2014). The fact that humanitarian organisations are involved in multiple ad hoc supply chain operations and typically work in highly diverse operational environments (Merminod *et al.*, 2014) increases both their risk exposure and the complexity/uncertainty that they have to manage.

The many disruptions and constraints encountered in the field are barriers to effective and efficient supply chain operations. They create bottlenecks, increase lead times, bring about delays, lead to cargo losses, and raise the costs of delivering the right humanitarian items to the right place, at the right time, and in the right quantities (L'Hermitte *et al.*, 2014). Therefore, in order to ensure the continuity of their supply chain operations, humanitarian organisations need to build and maintain agile capabilities. In other words, they need to be able to develop and implement swift adjustments in response to changing environments and disruptive events along the supply chain.

As observed by L'Hermitte *et al.* (2015) who reviewed the humanitarian logistics literature on agility, the concept and its importance have been repeatedly discussed. For example, Cozzolino *et al.* (2012) and Scholten *et al.* (2010) note that agility is essential in the humanitarian context due to the life-saving objective guiding the work of aid agencies. Other authors (Gattorna, 2006; Tatham and Christopher, 2014) argue that, due to the complexities and dynamics encountered in humanitarian environments (e.g. uncertainties as to when and where disasters will strike as well as the extremely fast-moving and unpredictable local conditions), agility is the key to successful humanitarian operations. This can be illustrated by recent disaster situations such as the 7.8-magnitude earthquake in Nepal in April 2015 where the scale of the disaster, the high level of transport and communication infrastructure destruction, the limited capacity of the Kathmandu airport and its resultant inability to cope with the flow of humanitarian supplies, as well as the topographic characteristics of some of the areas struck (i.e. mountainous areas with limited road access) have led humanitarian organisations to find agile solutions to overcome these challenges and get the urgently needed life-saving supplies on the ground. This included swiftly activating the Logistics Cluster^[1], coordinating the relief efforts to deal with the large-scale humanitarian needs and to avoid gaps and/or overlaps, using military resources, mobilising a truck fleet to reach the areas accessible by road as well as helicopters to access the isolated locations, and arranging storage outside Kathmandu and Nepal to prevent congestion at the points of entry (Logistics Cluster, 2015b). In the same way, agility was essential in the aftermath of Cyclone Pam (March 2015) in order to rapidly mobilise resources and deliver relief items to the affected inhabitants of the remote islands in the archipelago of Vanuatu. To this end, emergency

supplies that were pre-positioned in humanitarian depots in Dubai and Malaysia were swiftly deployed, mobile warehouses built, communication re-established, and the supplies delivered to those in need by any means possible including trucks, boats, helicopters, and/or air taxis (WFP, 2015c).

L'Hermitte *et al.* (2015) argue that, within the current humanitarian logistics literature, the concept of agility is mostly studied at the operational level and framed as the ability to conduct responsive and flexible operations. This operational approach is not only taken by academics, but also by practitioners, possibly because the latter mainly focus on their daily routine and on the need to rapidly solve problems at the operational level without considering the potential root causes of these problems at a higher level of the organisation (Pedraza-Martinez *et al.*, 2013). This operational focus may also relate to the perception of logistics as an operational function of humanitarian organisations rather than a strategic one (Whiting and Ayala-Öström, 2009).

However, L'Hermitte *et al.* (2015) establish that focusing solely on operational considerations significantly limits the scope of the concept of agility and, therefore, constitutes an important research gap. They further argue that humanitarian logistics agility requires a strategic approach and that agile operations are the result of decisions and actions of leaders and managers. Using the contributions of prior research on agility in a business context, L'Hermitte *et al.* (2015) develop an extended model of agility in humanitarian logistics, and identify four strategic level agility capabilities (being purposeful, action-focused, collaborative, and learning-oriented) as well as three sets of agility enablers (people, processes, and technology).

This paper focuses on the cornerstone of L'Hermitte *et al.*'s (2015) conceptual model, i.e. on the four above-mentioned capabilities. It explores their empirical relevance to the humanitarian environment and contributes to understanding how they support the development of agility in humanitarian logistics. Doing so is necessary because, although L'Hermitte *et al.* (2015) argue that the capabilities need to be developed at the strategic level of a humanitarian organisation in order to enhance the organisation's operational capacity to appropriately respond to unpredictable and disruptive events, their research remains conceptual and has not been supported by empirical evidence. The purpose of this paper is, therefore, to address this limitation by presenting exploratory research that examines the following question:

How do the four strategic level capabilities contribute to the development of field-level agility in humanitarian logistics?

The remainder of this paper is structured as follows. Section 2 provides an overview of the four strategic level capabilities outlined earlier. Section 3 presents the qualitative methodology before Section 4 examines the research findings. Next, Section 5 discusses these results and Section 6 considers the contribution, implications, and limitations of this study. Section 7 provides concluding comments.

2. The strategic dimensions of agility

Initially developed in the manufacturing discipline (e.g. Goldman and Nagel, 1993), the concept of agility has been subsequently studied in strategic management (e.g. McCann and Selsky, 2012), supply chain management (e.g. Christopher, 2000), and project management (e.g. Appelo, 2011). According to the above-mentioned authors, agility transcends the technical, operational and functional levels of an organisation, and agile organisations exhibit a number of deep-rooted capabilities developed across the organisation as a whole. Therefore, through a detailed consideration of the well-established literature on agility in a business context and, especially, in the above-mentioned fields, L'Hermitte *et al.* (2015) argue that the achievement of agility in humanitarian field operations is supported by four distinctive but mutually reinforcing capabilities that need to be developed and sustained at the highest level of a humanitarian organisation.

The first strategic level capability, *being purposeful*, is the ability to maintain a clear direction for action throughout the whole organisation. It is the foundation capability and serves as a reference point that sustains a strong identity whilst, at the same time, contributing to focusing and guiding action (McCann and Selsky, 2012). A clear purpose is necessary to steer individuals, teams and the whole organisational system when they are exposed to unexpected and disrupting circumstances (Appelo, 2011). Thus, a clear purpose enhances agility because it provides perspective and direction, assists people and teams in setting the right priorities and, ultimately, establishes a foundation for acting confidently in stressful and ambiguous work situations (McCann and Selsky, 2012).

The second strategic dimension of agility, *being action-focused*, is about building readiness to be able to respond to risks, uncertainties, and opportunities occurring along the supply chain. In particular, being action-focused is about providing operational staff with appropriate tools that enable them to recognise and manage field contingencies in a swift and effective manner in order to avoid or mitigate negative impacts on logistics operations. The required tools are varied but include an appropriate level of skills, adequate resources, clear and standardised processes and procedures to deal swiftly with common operational situations, delegated authority to enhance flexibility, short decision making lines and rapid approval protocols, effective leaders who drive action, as well as the availability of accurate and timely information that supports fast decision making and responsiveness. The combination of these elements contributes to the development of readiness and to the building of agility (Weick and Sutcliffe, 2001; Appelo, 2011; McCann and Selsky, 2012).

The third strategic level capability associated with agility, *being collaborative*, relates to the building and sustaining of internal and external relationships in order to solve problems collaboratively. Being collaborative is an essential capability because agility cannot be built by a single person or a single organisation. Rather, agility stems from people and organisations calling on each other and building a collaborative and integrated network of relationships both internally and across the supply network. Well-developed relationships are essential to agility building because they enable people and organisations to deal with problems that go beyond their own ability to solve (McCann and Selsky, 2012). Therefore, it is important that staff are familiar with the roles and responsibilities of others beyond the confines of their own job, and that they appreciate how they can collaboratively overcome

disruptions (Weick and Sutcliffe, 2001). It is also essential that leaders and managers develop mechanisms to support not only trust and coordination throughout and beyond the organisation, but also the integration of the different parts of the organisation (Tatham and Kovács, 2010; McCann and Selsky, 2012).

The fourth strategic dimension of agility, *being learning-oriented*, is the ability to identify and capture past experiences, to critically evaluate and absorb them, and to share lessons in order to improve practices. Being learning-oriented is an integral part of agility because past ways of operating may no longer be appropriate and/or efficient/effective enough. Therefore, an organisation should continuously look for new solutions, create and transfer knowledge, and modify its plans and ways of functioning accordingly (Garvin, 1993; Weick and Sutcliffe, 2001). Similarly, McGill *et al.* (1992) take the view that responding proactively, rapidly, and effectively to changes in the environment requires the development of learning practices. Thus, to be agile, an organisation needs to continuously question how it operates and the adequacy of its responses to disruptions. To this end, an organisation learns from past experiences, ensures that appropriate action is taken as a result of these experiences, and shares lessons to improve future ways of working. In other words, by developing learning, an organisation goes beyond fixing immediate problems and reconsiders systemic issues involving the organisation as a whole (Redding and Catalanello, 1994; Senge, 2006).

This strategic approach to agility has, to date, not been taken in the humanitarian logistics discipline that primarily associates agility with operational level considerations. For example, practitioners frequently relate agility to logistics skills and the ability of logisticians to adapt operations. This includes, among other things, expertise in shipping that enables an organisation to use both regular container ships and chartered vessels to increase flexibility (WFP Logistics, 2015). For practitioners, adapting to changes and disruptions along humanitarian supply chains is also associated with the ability to find creative solutions and to fix immediate problems at the operational level (WFP, 2013b; d, 2014).

Whilst a number of higher level considerations are mentioned in professional sources, they are not related to the development of strategic capabilities and they are not part of an integrated view of agility at the organisational level. These considerations include, for example, the creation of a centralised information management unit that supports timely and informed action, as well as the use of technological tools such as geospatial technology and early warning systems to enhance preparedness (WFP, 2013g) or the development of an IT platform that supports cargo visibility along humanitarian supply chains (GT Nexus, 2010). Organisational learning is also mentioned in professional sources where, for example, WFP (2009a) notes that evaluating past experiences and sharing lessons are necessary to capture and build organisational knowledge and to improve performance. However, WFP does not relate such organisational learning practices to agility and also acknowledges that, to date, no formal mechanisms are in place to disseminate lessons from evaluations in a timely and effective manner.

Like practitioners, academics do not associate agility in humanitarian logistics with the development of deep-rooted capabilities and, rather, see agility mainly as an operational ability (L'Hermitte *et al.*, 2015). This includes, for example, the ability to swiftly evaluate the needs of those affected in the aftermath of a disaster (Charles *et al.*, 2010), to deploy

emergency teams to the field at short notice (Cozzolino *et al.*, 2012), as well as to rapidly adapt the type and/or the volume of the relief items delivered (Charles *et al.*, 2010).

Oloruntoba and Kovács (2015) consider agility not only as a response to the unpredictability of the humanitarian needs, but also to funding uncertainties, to the heterogeneity of the humanitarian organisations involved in the supply networks, and to the evolving nature of the humanitarian work that includes the full spectrum from emergency to development responses. A number of authors also go into the details of the agility mechanisms. For example, Altay and Pal (2014) focus on the use of clusters and argue that this approach speeds up information sharing, facilitates coordination, and improves information quality. This, ultimately, supports prompter and better humanitarian responses. Thompson *et al.* (2006) highlight the important role of information technology and, in particular, decision support systems in facilitating timely decisions such as those related to resource acquisition and allocation, as well as task assignment. Thus, decision support systems contribute to improving humanitarian responses in complex and swiftly changing decision making environments. Altay *et al.* (2009) identify a number of strategic planning activities that support humanitarian logistics operations, such as the development of internal and external coordination plans, the improvement of trust and communication throughout the entire supply network, the creation of cross-functional teams, and the establishment of long-term relationships with carefully selected suppliers. Similarly, Dubey and Gunasekaran (2016) argue that the performance of humanitarian supply chains depends on long-term capacity building that includes the integrated development of a number of elements such as information sharing, training, situational awareness, responsiveness, flexibility, and adaptability. Going one step further, Dubey *et al.* (2015) study the impact of agility (in the authors' analysis, agility is comprised of dynamic sensing, responsiveness and flexibility) on the logistics and life-saving performance of humanitarian organisations which includes reducing the number of casualties, improving response time, reducing stock-outs, and increasing delivery quality. The authors also consider the essential role of leadership in this process.

The above studies discuss several key dimensions related to the concept of agility but they do not consider agility as the result of the integrated development of organisational capabilities. On the other hand, a number of authors discuss the relevance of the four above-mentioned strategic dimensions to the field of humanitarian logistics (e.g. Maon *et al.*, 2009; Tomasini and Van Wassenhove, 2009; Balcik *et al.*, 2010) but their research is not in relation to the concept of agility. The first steps in that direction are those of L'Hermitte *et al.* (2015) who have developed, and considered the applicability of, the four strategic level agility capabilities to the humanitarian context but their work remains conceptual. We, therefore, aim to explore these four strategic dimensions of agility in order to demonstrate empirically that they are relevant to the humanitarian logistics context, and also that they play a role in the ability of humanitarian organisations to conduct agile field operations. In other words, we posit that building deep-rooted strategic capabilities that underpin capacity building at the whole organisational level supports operational agility. Figure 1 presents this organisational view of agility.

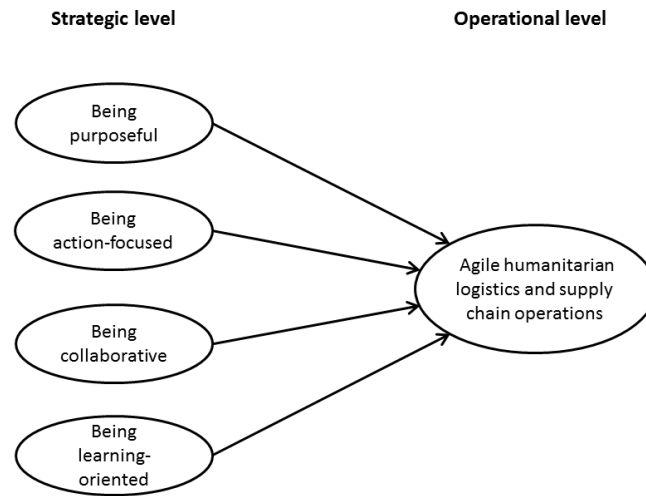


Figure 1: Systems view of agility in humanitarian logistics

The remainder of this paper is designed to consider the validity of the above perspective. In line with what Saunders *et al.* (2009) consider to be exploratory research, our study is motivated by the need to understand a phenomenon about which little is known and that can only be conceptually delineated. To this end, qualitative data was collected and analysed, as is explained in the next section.

3. Methodology

3.1. Collecting data: case study research and interviews with humanitarian logistics experts

A single case study is used in order to explore the four strategic level capabilities. A case-based approach is appropriate to the current research because case studies support exploratory research and help clarify the boundaries of ill-defined concepts (Yin, 2003). They also enable researchers to study the complexity of logistics and supply chain management issues and to contribute to management practice and policy (Seuring, 2005). Thus, in the absence of prior empirical research on the strategic determinants of agility in humanitarian logistics, and given the intricacies underlying the concept of agility (see, for example, Sherehiy *et al.*, 2007), a case study approach is expected to facilitate research exploration and to provide a real-life narration of the strategic mechanisms underpinning agility in humanitarian logistics. In other words, in light of Eisenhardt's (1989) suggestion, a case study is used in this research in order to observe and understand the dynamics of the studied phenomenon within a real-life setting.

Given the large variety of humanitarian organisations operating in disaster relief environments (Kovács and Spens, 2007) and, arguably, the different ways of achieving agility, our research is focused on one single organisation, i.e. the United Nations (UN) World Food Programme (WFP). WFP has been selected because it constitutes a critical case (Yin, 2003) due to the expertise of this organisation in the field of humanitarian logistics. This expertise has resulted in WFP being appointed leader of the UN Logistics Cluster^[1]

(Logistics Cluster, 2015a) and to be granted the 2014 European Supply Chain Excellence Award in the category ‘Austere Environments and Contingency Logistics’ (Logistics Manager, 2014). WFP also assists other UN and non-governmental organisations (NGOs) as a provider of logistics services in addition to conducting its own supply chain activities (WFP Logistics, 2013). In this context, the selection of WFP is information-oriented, i.e. based on the expectation that the data collected will be relevant to the research topic (Flyvbjerg, 2006).

Within the framework of the above-mentioned case study, the data were collected by means of a series of 29 face-to-face interviews that were conducted at WFP’s global headquarters in Rome with staff working at the strategic and at the operational levels of the organisation. Given the multi-level perspective of our research, interviewing staff at both levels was necessary to gain a strategic as well as a field perspective. The participants (e.g. logistics officers, logistics coordinators, logistics cluster officers, emergency preparedness and response officers, heads of logistics, directors and deputy directors working in logistics) were selected for their extensive experience (for example, 27 of them have been working in humanitarian logistics for over 10 years). The sampling was, therefore, purposive, i.e. respondents were selected based on the type of information needed and their ability to provide the most relevant insights in relation to the research (Saunders *et al.*, 2009). The participants included:

- 9 field workers (logistics staff with previous field experience as well as logistics staff still working on the ground),
- 9 support staff working at the headquarters in functional positions,
- 11 managerial staff working at the headquarters in middle and senior management positions.

The average interview duration was some 40 minutes. Both unstructured and guided interviews were conducted, noting that these two techniques are commonly used in exploratory research and in early data collection stages (Olson, 2011). The questions focused on each of the four strategic level capabilities, as indicated in Table 1.

The aim of case-based research is the creation of knowledge and the formulation of theoretical insight related to a given phenomenon of interest. However, the type of knowledge created differs on the basis of the roles and interplay of theory and empirical data in each case study (Ketokivi and Choi, 2014). Thus, according to Ketokivi and Choi (2014), the purpose of case-based research can be either theory generation, theory testing, or theory elaboration. Our research uses prior theoretical knowledge that delineates the areas of investigation, identifies the constructs of interest, and shapes the conceptual design of agility. In particular, our study builds on the work of L’Hermitte *et al.* (2015) who make use of the dynamic capabilities model (Teece and Pisano, 1994; Teece *et al.*, 1997) and draw on the existing business literature on agility in order to conceptualise the organisational view of agility and to identify the four strategic capabilities expected to support agile humanitarian logistics operations. Therefore, our case-based research emphasises Ketokivi and Choi’s (2014) theory testing approach that, according to the authors, is about situationally grounding a general theory. In other words, our research tests L’Hermitte *et al.*’s (2015)

theoretical propositions by contextualising them and collecting and analysing empirical data on the four capabilities within the context of WFP.

Interview topic covered	Interview questions
General questions	- When people talk about agility and about making WFP a more agile organisation, what do they mean?
	- What actions are taken at the strategic level of the organisation to support the agility of logistics operations?
Being purposeful	- In your opinion, is WFP an organisation with a clear purpose? Why?
	- In your opinion, does a clear purpose lead to more responsiveness and flexibility in the field? If yes, how? If no, why?
Being action-focused	- What does WFP do to ensure that field workers are able to take appropriate action on the ground?
Being collaborative	- Which working relationships (internal and external) are essential for field workers to achieve responsiveness and flexibility on the ground? Why?
Being learning-oriented	- Are there formal mechanisms in place at WFP to capture and to share learning from past operational failures and successes? If yes, which ones? If no, why?
	- In your opinion, does organisational learning lead to more responsiveness and flexibility in the field? If yes, how? If no, why?

Table 1: Questionnaire for guided interviews

3.2. Making sense of the data: qualitative content analysis

To make sense of the interview data, a qualitative content analysis was conducted. Content analysis is a social research method commonly used for scientifically and systematically studying text data, and, in particular, for evaluating, classifying, and categorising their content (Churchill, 2013). Content analysis has been recognised as an appropriate method to study qualitative data in case study research (Kohlbacher, 2006) and has previously been used in the humanitarian literature (e.g. Scholten *et al.*, 2014).

To support this analysis, a categorisation and coding system was used. According to Weber (1990), categorisation involves the delineation of meaningful categories used to group similar text content together. As our research is linked to an existing body of knowledge, our analytical framework is derived from a priori categories, i.e. categories previously established in the literature. The predetermined categories of our content analysis are those described in Section 2, i.e. being purposeful, action-focused, collaborative, and learning-oriented.

Beyond these four strategic level capabilities, 13 sub-categories were derived from the literature on agility in a business context and, more specifically, from the following key sources used by L'Hermitte *et al.* (2015): McGill *et al.* (1992), Redding and Catalanello (1994), Weick and Sutcliffe (2001), Gattorna (2006), Sherehiy *et al.* (2007), Appelo (2011), Christopher (2011), and McCann and Selsky (2012). This literature was reviewed and,

following Churchill's (2013) recommendation, enlightening categories were selected, i.e. categories which produce a breakdown of content that is analytically relevant and coherent. Specifically, the sub-categories were developed to reflect the properties of the investigated phenomena (Berg, 2007), namely the four strategic level capabilities as conceptualised and described by L'Hermitte *et al.* (2015). The sub-categories are, therefore, said to be deductive (Berg, 2007). The resultant categorisation framework and coding scheme are presented in Table 2.

Categories	Sub-categories	Sub-category codes
Being purposeful Code: PURPO	1. Clear organisation's purpose	CLEAR PURPOSE
	2. Actions guided by the overall purpose	ORIENTED ACTIONS
Being action-focused Code: ACTION	3. Appropriate skills and personal attributes	SKILLS
	4. Adequate level of resources and rapid resource (re-)deployment	RESOURCES
	5. Suitable processes and procedures	PROCESSES
	6. Self-organised and empowered teams	EMPOWERMENT
	7. Effective leadership	LEADERSHIP
	8. Availability of information	INFORMATION
Being collaborative Code: COLLA	9. Relationship building and collaborative problem solving	COLLABORATION
	10. Integration of the different parts of the organisation (eliminating silos)	INTEGRATION
Being learning-oriented Code: LEARN	11. Identification of past operational successes and failures	IDENTIFICATION
	12. Critical evaluation of practices based on past experiences	EVALUATION
	13. Sharing of the lessons learned	DISSEMINATION

Table 2: Categorisation framework and coding scheme

The first and second sub-categories listed in Table 2 reflect the fact that to be purposeful, an organisation needs a clear purpose that guides and focuses action in disruptive environments (McCann and Selsky, 2012). The next six sub-categories are the elements driving action. Thus, individual skills and personal attributes (e.g. being problem-solving and creative) support people's ability to act and react rapidly and in a confident manner (McCann and Selsky, 2012). These individual skills/attributes should be supported by the swift deployment and redeployment of resources (McCann and Selsky, 2012) across operations. Going one step further, standardised and effective processes and procedures are essential to support swift resource (re-)deployment as well as routine decision making and, ultimately, to ensure a smooth-flowing logistics pipeline (Christopher, 2011). Decentralisation of decision-making as well as empowerment also promote action by making teams able to manage their own

work and act appropriately in order to respond to the turbulence in their operational environment (Appelo, 2011). Similarly, effective leaders who sense the environment and are able to be decisive and drive action in order to cope effectively with the requirements of this environment are critical to support swift action (Gattorna, 2006). According to Christopher (2011), an action-focused organisation also needs information technology that enhances visibility and facilitates process integration, relationships as well as rapid decisions.

The ninth and tenth sub-categories reflect the fact that an organisation needs to build and maintain active internal and external relationships in order to be able to call on partners when dealing with turbulence and problems beyond its own ability (McCann and Selsky, 2012). Most importantly, the multiple dependencies between functional teams make cross-functional communication and coordination necessary (Appelo, 2011). The last three sub-categories relate to learning-orientation. Especially, identifying past operational successes and failures, critically evaluating these past experiences to re-evaluate and improve current practices, and sharing these lessons enable an organisation not only to create and transfer knowledge, but also to improve its operations as well as the management of change and uncertainty (Redding and Catalanello, 1994; Weick and Sutcliffe, 2001).

A manual approach based on a colour system was adopted to process the 29 interview texts and to relate the data to the analytical framework presented in Table 2. The content of each interview was carefully reviewed by the lead researcher in order to code the relevant units of analysis. As recommended by Hsieh and Shannon (2005), units of analysis that appeared to be relevant but could not be coded were identified and subsequently reviewed to determine if they represented a new category/sub-category. This was perceived to be an important part of the overall process because, as noted by Schilling (2006), the actual content of the interviews may transcend the boundaries of the predetermined categories. Indeed, as will be further explained in the next section, one new sub-category was identified. Next, the units of analysis associated with one particular sub-category were pieced together and analysed in order to derive meaning from the data (Zhang and Wildemuth, 2009). This analysis is presented in the next section.

As categories are supposed to be mutually exclusive, the coding process should, theoretically, be straightforward. However, in reality, and as observed by Zhang and Wildemuth (2009), overlaps exist and it may sometimes be difficult to assign a code to a particular passage. To overcome this issue and to increase the reliability of our research, the coding was discussed within the research team and tested on a sample of text, as suggested by Schilling (2006) and by Zhang and Wildemuth (2009). In addition, in order to prevent any bias in the coding and in the subsequent analysis of the data and, ultimately, in order to confirm the validity of our results, two co-researchers controlled the way the interview content was used and interpreted in the paper. The next section presents the findings of our content analysis.

4. Findings of the content analysis

The presentation of our findings is guided by the categories and sub-categories identified in prior research and used to code the interview data (see Table 2). Zhang and Wildemuth

(2009) suggest that the presentation of the content analysis results should balance description and interpretation. We, therefore, report representative quotations to support our analysis and our conclusions. The reference attached to each quotation reflects the three categories of respondents identified above (FW1-9 for field workers, SP1-9 for support staff, and MA1-11 for managerial staff) and the sequence number in the interview document.

4.1. Being purposeful

The analysis of the data demonstrates that the first strategic level capability, i.e. being purposeful, plays an important role in the building of agility. More specifically, the interview data confirm that a clear purpose provides perspective and sustains a positive identity, even in turbulent environments. For example, Field Worker #6 states that *'we have a clear mission statement, to fight hunger, everyone knows that'* (FW6-04). Similarly, Field Worker #3 mentions that *'the purpose is all around us, there are pictures everywhere in the building. We know that our purpose is to deliver whatever whenever'* (FW3-02). The interview data also indicate that a clear purpose provides a direction for action. As pointed out by Support Staff #4, *'you really have to know what the purpose is and find the ways to work towards meeting or achieving that purpose'* (SP4-01). Similarly, Field Worker #2 indicates that *'everything is guided by the final objective that is to deliver'* (FW2-03). Thus, the interview data show that having a clear organisational purpose provides the perspective that orients behaviour, i.e. the perspective against which the decisions and actions are taken and the priorities are set.

Most importantly, in order to support agility, this organisational purpose should be clearly understood and shared at all levels of the organisation. According to Managerial Staff #7, *'each and every unit or division should see their part simply as a chain in the overall system that is connected with the purpose of serving the beneficiaries'* (MA7-05). When the actions of some parts of the organisation are not guided by the common organisational purpose, this impedes agility: *'at headquarters [...], because people are focused more on processes and all that, sometimes, it [the purpose] does get lost. When you say "did you get this signature here or who approved that?", that kind of things, sometimes it tends to get in the way'* (MA7-06). It is, therefore, essential to recognise that *'the ultimate goal is to save lives, not to be bureaucratic'* (MA9-05), and to define a common value-driven agenda that focuses action and supports priorities and rapid decisions across all levels of the organisation.

Beyond the organisational boundaries, agility should be supported by a common purpose shared by all the partners participating in the relief effort. However, *'the problem is that organisations have different roles and perspectives and, because of this, decision making takes more time'* (MA8-01). Similarly, the operational choices made to overcome disruptions may differ, especially when humanitarians and the military operate together: *'the army mitigates threats by increasing the number of arms, this is a bunker approach. The humanitarians prefer to use other strategies, arms are a last resort'* (FW5-05).

To summarise this section, a clear overall purpose that guides action contributes to the ability of humanitarian organisations to make swift decisions and, ultimately, to deliver relief items in a timely manner. Therefore, leaders and managers have a clear role to play in sustaining a

strong and value-driven identity that prompts commitment, provides a clear direction for action and supports agility. They should also define a common agenda that is well understood and unambiguously supported not only within the organisation (and at all levels of the organisation), but also among the various actors participating in the supply network.

4.2. Being action-focused

The interview data confirm that the six elements associated with being action-focused (see Table 2) are essential to the building of agility, as demonstrated below.

4.2.1. Appropriate skills and personal attributes

A number of interviewees explain how skills, experience, and personal attributes enhance agility. Thus, according to Field Worker #6, *'the final stage of an organisation's resilience and flexibility relies on people'* (FW6-17). *'So Pakistan, it's a super agile country office. I don't know how many emergencies they've done, it happens every year. They're all ready [...], it's an adaptive group of people. Some country offices, they don't have experienced staff to cope with a major emergency'* (FW6-19). Similarly, Field Worker #8 considers that *'the experience of the field workers, their motivation, their mindset, and the commitment of the staff in the most remote locations contribute to the highest level of agility'* (FW8-04). Going one step further, this respondent explains that *'if, for example, we have to respond to sudden circumstances in country X or Y, we will always have in WFP's staff members, two or three colleagues who know this country very well and who can be immediately deployed to solve the problem. This is due to the international nature of WFP, we have colleagues from all five continents. This is a great strength, in my opinion, this contributes to flexibility'* (FW8-06).

4.2.2. Adequate level of resources and rapid resource (re-)deployment

An adequate level of other resources is also critical to the building of agility. In particular, a number of interviewees highlight the importance of funding and how slow and inflexible approaches to funding impede agility. Since commercial organisations do not depend on funds that are voluntarily provided, funding is not identified as an agility factor in the research on agility in a business context. It has, however, been recognised as an essential element that impacts on the capacity to respond of humanitarian organisations, and on the speed and flexibility of their response (Redvers, 2014; Wakolbinger and Toyasaki, 2014). Thus, Managerial Staff #3 mentions that *'everything is driven by donors'* (MA3-03) and Field Worker #3 confirms that *'all depends on funding. If funding is there, then everything goes well and quickly. If no funding is there, nothing happens'* (FW3-06). Thus, *'the main bottleneck is that we do not have resources sitting somewhere that we can tap at any point in time. [...] We depend on the resources that are voluntarily given to us, then, timeliness can become an issue'* (MA2-06).

In addition to funding, the interview data indicate that agility depends on the rapid deployment and redeployment of resources, e.g. *‘the capacity, in the case of emergencies, to deploy aircraft and stocks’* (FW9-08). Resources also include *‘a fleet of 650 trucks owned by WFP and deployed in about 20 countries. [...] There are different circumstances that require the deployment of our trucks. For example when there are access problems, we deploy special trucks’* (SP3-01). In addition, *‘we have been implementing regional intervention fleets. This supports agility. [...] To respond to an emergency, usually in difficult environments, vehicles need to be deployed within one week. Otherwise, it is too late’* (SP3-03). Support Staff #9 confirms that the development of regional truck fleets is *‘a very useful initiative because you reduce the lead time to get trucks to the field of operations in an emergency [...], helping with the organisation’s ability to respond in a more timely and effective fashion’* (SP9-01).

4.2.3. Suitable processes and procedures

Suitable processes and procedures are perceived to be essential to agility building because they enable field staff to quickly deal with common operational situations. As observed by Managerial Staff #9, *‘predefined processes and procedures streamline action and provide direction to people working in complex and sudden emergencies’* (MA9-01). However, at the operational level, overly strict processes and procedures can become an impediment to agility. For example, Field Worker #3 mentions that *‘it is important to avoid putting people into a tunnel. Field workers should not be compelled to stick to procedures that are too strict’* (FW3-08). Therefore, *‘one of the challenges here is to strike a balance between being guiding but not being restrictive because we work in many countries and the circumstances under which our various country offices and various field projects are operating are really significantly different from one another. But there are also a number of common denominators that apply across the globe. So it is basically striking a balance, issuing guidelines that are not how to switch off and fix the dishwasher but, basically, laying down the ground principles’* (SP4-05).

Striking such a balance is made difficult by the governance model of humanitarian organisations because they are accountable to their donors and need to ensure that the requirements put on them by donors are met. *‘Especially for humanitarian agencies or publically funded organisations like ours, you have the obligation to account to the public how the resources that you have been entrusted with have been utilised. [...] I think that is really one of the differences between us and the private sector because, for example, in the private sector, as a unit manager, you probably have more span of control, a certain type of decisions that you can take. That tends to be limited for us, so this really has an impact on agility. If you look at our procurement processes, we have to, for the most part, buy through tenders. That takes time, you have to send out the tender, give sufficient time to the suppliers to respond, then do your analysis, then get a committee in here to sit and, sometimes, it’s not easy to constitute those committees because members travel. So either you get a replacement or you have to set the meeting at a different date, and then once you go through this committee, depending on the value, there are different levels of approvals and everybody has to sign off’* (MA7-07).

Nevertheless, the interview data make it clear that, sometimes, it is necessary to circumvent the established rules. In this respect, agility depends on the ability to have direct access to key decision makers and to have in place quick decision making processes. As pointed out by Managerial Staff #6, *'not all procedures can be complied with in emergency situations'* (MA6-13). Field Worker #2 confirms that *'sometimes, there are strict procedures that need to be bypassed. WFP can do this'* (FW2-04). This point is illustrated by Field Worker #9: *'if in 5 minutes I need an airplane for Iraq, it is possible to go to the top level and to make it happen [...], this is a red line that enables you to get a quick decision, a waiver, somebody who commits and says "go ahead", send an airplane and we will fix it later'* (FW9-08).

Managerial Staff #9 summarises the above discussion by saying that *'processes and procedures are about building a high performance machine while keeping things clean'* (MA9-11).

4.2.4. Self-organised and empowered teams

The analysis of our data suggests that humanitarian organisations need to decentralise authority and empower the field because *'a lot of hierarchy does not support agility'* (FW3-05). Thus, *'it is important to let field workers know what has to be achieved and to let them decide how to achieve it'* (FW3-10). Support Staff #4 also explains that empowering teams includes letting the country offices adapt and refine the previously mentioned procedures because specific conditions exist in each operation: *'some country offices go ahead and develop their standard operating procedures for a particular activity which is broadly described in the normative guidelines where [...] the minimum requirements are spelt out which need to be met but, sometimes, you need to go further into the detail'* (SP4-11).

Adjusting procedures to respond to the requirements of specific operational environments supports agility because teams are able to better manage and streamline their own work. In addition, as confirmed by a number of interviewees, *'decentralising authority at the country level enhances agility'* (SP2-09) because *'the decision is much closer to the beneficiaries and much faster'* (MA5-10). For this reason, *'there is a trend to shift the centre of gravity to the field, to decentralise decision making and to empower teams'* (MA9-07).

4.2.5. Effective leadership

As mentioned earlier, this paper highlights the crucial role of strategic leadership in agility building. Importantly, interviewees also see operational leadership as an essential component of agility and, in particular, of rapid decision making. Thus, effective leaders are seen by the interviewees as individuals who are not hesitant and are able to make the appropriate decisions to meet the requirements of the field. For example, Field Worker #4 mentions that *'agility comes from leaders who make decisions, not from administrators who only apply the rules'* (FW04-07). Field Worker #6 confirms that *'it depends a lot of the individual, namely the country director'* (SP6-02) but *'with the right people at the right decision making place, yes, it works'* (SP6-18).

4.2.6. Availability of information

The interview data also provide insights on the importance of information in the development of agility and, in particular, logistics and risk-related information. In regard to logistics information, Managerial Staff #1 explains that *‘we are heavily using outsourced services. [...] A transporter delivers the goods to a warehouse, from the warehouse, it’s delivered to another transporter, the transporter delivers to a mill, a mill delivers, etc. [...]. So at each point, the condition and the quantity of goods is established, is recorded, on paperwork or in the system, and this is, practically, the point where you know what you have, in what condition you have it, and between whom the passage happens’* (MA1-01). Being able to assess the status and the location of the stock in warehouses and in transit supports agility, i.e. it increases visibility and, in turn, enhances swift decision making and the rapid deployment/redeployment of resources.

In addition to logistics information, risk-related information is also perceived to be essential to the creation of agility and, more specifically, to assist decision making in uncertain situations. Thus, Support Staff #9 mentions that *‘we have done a lot of investment in early warning, analysis, and vulnerability mapping, which allows us to look a little bit further ahead, to anticipate potential shocks that can happen. Knowing what is coming there, we may already start to wrap up or gear up a potential response or send people into a place. Using the example of the Philippines, Typhoon Haiyan, just in November [2013], we had seen that typhoon developing and heading that way and before it even hit, we had already sent the people [...] to the Philippines, to be there already and already to establish networks’* (SP9-08).

4.2.7. Extensive field presence

In addition to the six above-mentioned elements, the interview data highlight an additional factor, i.e. the physical presence of an organisation in the field, as an essential antecedent to the development of readiness and to the building of agility. Field presence is mentioned by three interviewees. Thus, Field Worker #8 observes that *‘what contributes to WFP’s highest level of agility is its field presence. [...] This is what distinguishes us, we have warehouses, trucks, offices, colleagues in the most remote locations of the world’* (FW8-04). According to Managerial Staff #6, *‘WFP has this logistics structure in place in all countries of the world, with positions in all ports’*. Going one step further, Support Staff #9 explains how field presence differentiates WFP from other agencies and how this contributes to agility: *‘we have the deep field presence. Many organisations haven’t, they might get the country level, the capital level, whereas WFP is going down into the deepest parts of the country where we may be the only organisation represented in places, so we have that kind of coverage. That does cater towards our agility because we have [...] some kind of connection or network already out there so that, once something strikes, well, we’re not starting from scratch. We have something in place’* (SP9-07).

It can be concluded from the discussions in Sections 4.2.1–7 that action focus is a key element in agility building. In particular, leaders and managers can support flexibility and responsiveness in the field by (1) building workforce agility, (2) setting up mechanisms to

make resources available in a timely manner, (3) developing broad processes and procedures that streamline action without being too prescriptive and without preventing adaptability, (4) empowering those working in the field and locating decision making close to the point where action is needed, (5) having leaders in place who do not shy away from making decisions, (6) making the right information available to the right people at the right time, and (7) establishing a deep field presence that supports responsiveness in emergency situations.

4.3. Being collaborative

The interview data also reveal that the third agility capability, i.e. being collaborative, is critical to the building of agility. Especially, the importance of well-developed collaborative relationships is highlighted in a number of interviews and participants explain how collaboration must be developed at different levels, i.e. at the individual level, as well as inside and outside the organisation. At the individual level, *'rotations are important. They enable staff members to meet a lot of people and create a network of people. Then, you know who can help you and who you can contact directly'* (FW3-04). Some interviewees also mention the importance of the relationships between the field and the regional bureaux in order to solve problems collaboratively. For example, according to Field Worker #6, *'in the field, you rely a lot on the regional bureau. [...] If you have an issue, you call them. [...] For example, you have a staffing issue, you work in an emergency, you need someone quickly, your first port of call will be to discuss with the regional bureau'* (FW6-08).

Externally, collaborative relationships are needed with a number of actors and, among them, with national authorities because *'we are invited by the host government'* (FW6-03). External collaboration is also necessary among humanitarian organisations: *'you know the NGO that works in the area, you call the head of logs there'* (FW6-13). Thus, formal and informal contacts with the various participants to the relief effort enable field workers to solve problems more effectively and in an agile manner. However, external collaboration and agility can be impeded if organisations have different mandates. Therefore, there is *'the need for developing better coordination mechanisms between organisations with different mandates, in particular between humanitarian organisations and the military'* (FW5-01) because *'a lack of mutual understanding impedes effectiveness'* (FW5-06).

Beyond collaboration, creating an integrated system, i.e. eliminating silos between the different parts of the organisation to facilitate collaborative problem solving and agility is essential. For example, Managerial Staff #5 explains why integration is needed at the functional level: *'more supply chain integration is needed to move away from silos, namely demand pipeline (how much, when, and where), procurement, logistics, and financing (donors). Before, the linkages between those elements were sequential, now it is more back and forth'* (MA5-01). Thus, in order to streamline the flow of goods, functions need to clearly understand each other's roles and constraints. This concerns, in particular, *'the programme function that defines the needs and the strategy, and the logistics function that takes whatever they are given and make deliveries happen. [...] Until now, they have not understood each other. So now, we try to make sure that programme people understand what an operation is in terms of logistics and that the logistics people understand the constraints of the programme function when they define their strategy'* (FW9-11). As a consequence,

agility depends on the ability of a humanitarian organisation to break down functional silos and on the ability of the different parts of the organisation not only to understand each other's constraints, but also to work together in order to support responsive and flexible operations.

This section's discussions demonstrate that managing disruptions and constraints can be achieved by joining forces. Therefore, agility depends on leaders' and managers' inputs in terms of building trust, coordination, and integration. This should not only occur internally, i.e. between the different parts and levels of an organisation, but also externally, i.e. between the various participants in the relief effort and the components of each supply chain.

4.4. Being learning-oriented

The last strategic dimension of agility (i.e. being learning-oriented) and the role of learning in agility building are captured in the interviews. Specifically, the data indicate that the identification of past experiences (both previous operational failures as well as successes) is essential. Thus, *'there is, as part of the protocol, the requirement to perform lessons learned and after-action reviews. So it is now instituted. [...] We have actually created lessons learned packages, lessons learned exercises, packages and tools that when teams go out, they have already ready-made guidance and templates of a systematic way to conduct lessons learned'* (SP9-12). Most importantly, to create agility, learning should not be limited to the identification of past experiences, but should be followed by the critical evaluation of those experiences. Thus, past experiences should be analysed and this analysis used to improve the current practices that are no longer sufficiently relevant to the situations encountered in the field. As observed by Managerial Staff #9: *'the objective is to identify [...] what can be done to make WFP's processes faster and more streamlined. [...] All this enables the field to be responsive because they are provided with the right tools'* (MA9-08).

However, Field Worker #3 makes it clear that critically evaluating practices should not be a bureaucratic, but rather a practical exercise: *'if learning is about writing another procedure, it is constraining and does not support flexibility and responsiveness'* (FW3-11). In addition, such critical evaluation of past experiences should be continuous: *'not reinventing the wheel is important but in the field, everything changes all the time so wheels need to be changed all the time'* (FW3-09).

After having identified relevant experiences and critically evaluated practices in the light of these experiences, the learning process should include a further step, i.e. the dissemination of the lessons across operations and across structural units. This enables teams to use methods and techniques already tried and successfully tested in the field and, therefore, to speed up their decision making and enhance their anticipatory and adaptive skills. Doing so is all the more important as *'Dakar colleagues may be more knowledgeable about certain aspects than Bangkok colleagues. [...] Naturally, a certain expertise develops in one bureau because that's the type of issues that are usually occurring in that bureau, but that does not mean that it's never going to happen in another bureau'* (MA1-04).

However, although the need for learning is frequently emphasised in the field of disaster relief, it is not yet institutionalised in the humanitarian sector, as observed by IRIN (2014)

and as confirmed by the interview data. According to Support Staff #6, *‘there is always something more important to do, this is not a priority. So the recommendations are not followed up. This is a shame because people in the field often face similar situations’* (SP6-05). Similarly, Field Worker #8 complains: *‘how many times we have to reinvent the wheel, to put things in place again! Overall, we are more action-oriented than focused on the analysis of the action. [...] And yet, this [learning] can be beneficial if this prevents us from redoing things, from reinventing things that have already been developed’* (FW8-08).

The findings of this section indicate that organisational learning has the ability to enhance agility but is not used to its full potential. In other words, WFP still needs to develop an integrated system that institutionalises and systematises learning in order to better support agility in the field.

4.4. Quantitative approach to the interview data

Although the aim of this paper is to derive qualitative meaning from the interview data in order to explore the relevance and contribution of the four strategic level capabilities to agility in humanitarian logistics, Berg (2007) notes that content analysis is a flexible research method that lends itself to a quantitative approach, for example when the textual elements are tallied. We have, therefore, reported in Table 3 the topics raised by each interview participant and we have totalled these numbers up.

This table shows that collaboration (i.e. building relationships and solving problems collaboratively) is the sub-category most frequently mentioned by the interview participants (the topic was raised by 20 out of 29 participants). It is followed by the availability of suitable processes and procedures (raised by 18 participants) and by the institutionalised identification of past operational successes and failures (raised by 14 participants). These three sub-categories, which are mentioned by at least half of the interviewees, reflect the significance of the three following organisational capabilities: being collaborative, being action-focused, and being learning-oriented. It should also be noted that the eight sub-categories mentioned by at least one third of the participants (in addition to the three previously mentioned sub-categories: the availability of a clear organisation’s purpose, appropriates skills and personal attributes, an adequate level of resources, self-organised and empowered teams, as well as the integration of the different parts of the organisation) represent the four capabilities studied in this paper. We are aware that no statistical inference can be performed on this basis and that the numbers presented in Table 3 do not necessarily reflect the relative importance of each sub-category. However, we note that the topics most frequently raised by the interview participants reflect the four strategic level agility capabilities identified by L’Hermitte *et al.* (2015) and this confirms that each of them play a role in the building of agility in humanitarian logistics, as will be further discussed in the next section.

Capabilities	Sub-categories	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	Total
Being purposeful	Clear organisation’s purpose	X			X			X	X				X	X	X								X	X			X	X			11
	Actions guided by the overall purpose	X		X	X	X		X	X											X			X		X						9
Being action-focused	Appropriate skills and personal attributes	X				X			X					X	X			X			X	X		X		X				X	11
	Adequate level of resources and rapid resource (re-)deployment			X	X	X					X	X			X	X		X				X			X		X			X	12
	Suitable processes and procedures		X	X	X		X		X		X	X	X	X	X	X		X			X	X	X		X		X			X	18
	Self-organised and empowered teams	X			X				X		X		X		X						X		X		X		X				10
	Effective leadership	X				X			X					X	X							X									6
	Availability of information		X				X					X						X												X	5
	Physical structure available in the field														X								X							X	3
Being collaborative	Relationship building and collaborative problem solving	X	X	X	X	X	X	X	X	X	X	X	X					X			X	X		X	X	X	X	X			20
	Integration of the different parts of the organisation (i.e. eliminating silos)					X		X	X		X	X			X				X		X	X	X				X		X	X	13
Being learning-oriented	Institutionalised identification of past operational successes and failures		X		X	X							X	X	X		X					X	X	X	X		X	X		X	14
	Critical evaluation of practices and processes based on past experiences			X	X	X							X									X	X		X		X			X	9
	Sharing of the lessons learned						X		X					X			X	X			X					X	X			X	9

5. Discussion

The findings from the WFP case study provide supporting evidence that the four strategic level capabilities (being purposeful, being action-focused, being collaborative, and being learning-oriented) are empirically relevant to the humanitarian logistics context and that they support the development of agility. This confirms that these capabilities, initially derived from a review of the business literature on agility, can be transferred to the humanitarian sector. The analysis of the interviews also illustrates the role played by the components making up the four capabilities, i.e. by each of the sub-categories and, thereby, provides information about the rationale behind the contribution of the strategic capabilities to agility.

First, this study shows that a strong purpose focuses action and drives meaningful results in the humanitarian environment. In other words, a strong and shared humanitarian mandate supports rapid decisions and responses, and provides individuals and teams with a direction through the obstacles and challenges encountered in the field. However, in order to fully support agility, the organisational purpose should not only be well-understood and serve as a beacon in the field, but it should also be used to guide action and set priorities at all levels of the organisation and, in particular, in central offices.

Second, this research demonstrates that swift action and flexibility in the field can be supported by a number of tools including individual skills and personal attributes, adequate resources rapidly deployed/redeployed, standardised processes and procedures to deal with common operational situations, short decision making lines to manage exceptional emergency circumstances, delegated authority to facilitate and speed up decisions and increase flexibility, decisive leadership to make things happen, timely and accurate information to assist the decision making process and adaptability, as well as an extensive field presence to enhance field knowledge, the development of local networks, and responsiveness. The above elements enable an organisation to build readiness and to reactively and proactively manage change and uncertainty. Going one step further, the interview data illustrate how these elements interrelate with each other. For example, the availability of resources must be supported by adequate information systems that provide visibility as to which resources are available and where, as well as by appropriate procedures allowing for their rapid (re-)deployment. Similarly, a compromise has to be found between the need to standardise processes and procedures to support rapid routine decision making, and the need to decentralise authority and to empower teams in order to enable them to adapt to the specific circumstances prevailing in each operation. We conclude from this discussion that the agility factors cannot be considered in isolation and that a systems approach to agility is needed.

Third, building and maintaining internal and external relationships, i.e. being collaborative, enables logistics teams to be more responsive. Internally, this is because other functions (such as programming) better understand the constraints of logisticians and their need for flexibility, and take these factors into account when preparing the relief response. Externally, it is important to build a relationship network that can be called on to obtain support and overcome some of the issues encountered in the field. In other words, agility is generated by people and organisations working together and dealing with problems that go beyond their individual ability to solve.

Finally, the interview data provide evidence that the fourth capability (being learning-oriented) has not been fully developed by WFP and this confirms WFP's report (WFP, 2009a) mentioned earlier in Section 2. This report shows that organisational learning has not yet been considered as a priority and that WFP's current learning mechanisms should be improved to better translate knowledge into practice. Doing so is all the more important as the interviewees clearly indicate that organisational learning has the potential to support agility and, in particular, better operational solutions and swifter responses. However, the interviewees also mention that, to support agility, the lessons learned need to be shared rapidly, i.e. before they become obsolete, and should be used to improve future work rather than to increase control and bureaucracy.

Given its exploratory nature, the role of this research is not to establish categorical cause and effect relationships between the four capabilities and the agility of logistics operations. It is also not its role to rank the categories and sub-categories by order of importance. As previously explained, our study is motivated by the need to understand a research phenomenon that has only been delineated conceptually and about which little is known. Accordingly, this paper establishes an emergent relationship between the strategic and operational components of agility, and calls for further research to be conducted in order to determine the strength of this relationship and to better delineate the intricate dynamics behind the building of agility.

That said, the significance of our work lies in the confirmation that the extended and multi-level approach to agility conceptually developed by L'Hermitte *et al.* (2015) is empirically relevant, and in the demonstration that creating and sustaining agility requires humanitarian organisations to concurrently consider a large number of factors. As a consequence, building agility requires a systems view as well as leadership inputs, and cannot be considered as a technical and functional responsibility only. In other words, agility transcends operational matters, i.e. technical and functional skills as well as creativity and reactive adjustments in the field. This paper demonstrates that, on top of these operational factors, agility originates from structural arrangements and an organisation's internal behaviour. It is, therefore, essential for academics and practitioners to gain a better understanding of the dynamics behind the concept in order to make appropriate recommendations and to set the right conditions for agile operations.

It is also argued that this study advances L'Hermitte *et al.*'s (2015) work through an improved understanding of the underlying structure of, and the rationale behind, the four strategic dimensions of agility and by providing a list of strategic decision making areas that make up and support their development. Going one step further, the initial categorisation framework (that included 4 categories and 13 sub-categories, as presented in Table 2) has been refined and extended, so that the underlying mechanisms of agility better fit the particular environment in which humanitarian organisations operate. Our research, therefore, contributes to a better understanding of how the four strategic dimensions support logistics and supply chain agility. In particular, it highlights four important elements in the context of humanitarian logistics operations.

First, one additional determinant, i.e. the physical presence of humanitarian organisations in the field, has been identified as a factor that actively contributes to readiness and the

development of agility in a humanitarian logistics context. This factor is particular to the humanitarian environment and does, therefore, not stand out in the literature on agility in a business context. However, in the humanitarian literature, the essential role of a local presence in the ability of an organisation to timely respond to emergencies is recognised (e.g. Kovács and Tatham, 2009; Seal and Bailey, 2013).

Second, the interviews capture the key role of funding in humanitarian operations. More specifically, the content analysis confirms the research of other authors (e.g. Wakolbinger and Toyasaki, 2014) and demonstrates that slow and inflexible funding represents a financial constraint which impedes the prompt response of humanitarian organisations. The interview data also highlight that the processes and procedures of voluntary funded organisations must reflect donors' expectations and requirements and are, therefore, more constraining than the processes and procedures in the business sector. This, in turn, impacts on the degree of authority and control that humanitarian organisations can delegate to the field staff. As pointed out by a number of interviewees, a balance needs to be struck between the need for formal processes and procedures that enhance and support accountability to donors and the decentralised (as well as more flexible) practices that support the ability of the operational staff to adapt to the specific field circumstances.

Third, whilst the literature on agility in a business context (e.g. McCann and Selsky, 2012) mentions the importance of studying agility beyond the boundaries of an organisation, the relevance and the scope of this consideration are more far-reaching in the humanitarian context. In the humanitarian logistics literature, the large variety of the participants within the supply network is extensively studied (for example, by Kovács and Spens, 2007) and the significance of external cooperative and collaborative relationships in humanitarian operations is thoroughly analysed (for example, by Balcik *et al.*, 2010). Our research contributes to these discussions by confirming that inter-organisational relationships, coordination, and collaboration are essential to the development of agility. In particular, our analysis indicates that the various participants in the relief effort should develop mutual understanding, align (or at least reconcile) their respective purposes, share information, undertake joint planning, and learn from each other in order to improve operations and to support faster decisions and timely responses.

Fourth, in line with prior research (WFP, 2009a; Kruke and Olsen, 2012), the interviews reveal that the existing learning practices involve information gathering, processing as well as partial sharing rather than organisational knowledge creation. In other words, learning is currently not supported by a systematic, continuing, and dynamic framework (von Krogh *et al.*, 2000). To implement such a framework, tacit knowledge, i.e. knowledge gained from practical experiences and individual perceptions (Nonaka and Takeuchi, 1995), needs to be immediately captured and simultaneously shared in order to accelerate the learning cycle and prevent lessons from becoming obsolete before being disseminated (Redding and Catalanello, 1994). Leveraging individual knowledge and making it available to others (Nonaka, 1998) can be achieved by developing collective and participatory projects that turn a globally interconnected community of practice (here the field workers) into creative thinkers and sharers of experiences (Shirky, 2011). Most importantly, this should be an intra- as well as an inter-organisational endeavour (Nonaka and Takeuchi, 1995).

To this end, leaders and managers need to place the whole area of learning higher up the agenda and the organisational level, i.e. to institutionalise learning practices. Thus, in order to support and improve future work, leaders and managers of humanitarian organisations have an essential role to play in developing an organisational learning system that captures what works well and what does not work well in the field, that reflects on these experiences, that translates the lessons identified into improved and more relevant skills, processes and procedures, and that shares best practices across operations in a timely and relevant way.

6. Contribution, implications, limitations and further research

Overall, the results of our research establish that, in the humanitarian logistics context, agility transcends operations, requires a strategic approach, and needs to be built into the organisation. Since academic studies on agility in humanitarian logistics have, to date, mostly been operationally focused, the main contribution of our work is to extend the current perception of agility in a humanitarian context by empirically investigating a range of strategic level practices that influence the agility of humanitarian logistics and supply chain operations. Thus, as previously touched upon by a number of researchers in the field of humanitarian logistics (e.g. Kovács and Tatham, 2009; Tomasini and Van Wassenhove, 2009) and more recently argued by L'Hermitte *et al.* (2015), it is essential to take a systems approach to agility and to integrate strategic decision making into the analysis in order to gain a more comprehensive understanding of the concept. More concretely, our research emphasises the following key strategic decision making areas:

1. Supporting a clear and value-driven organisational purpose
2. Aligning actions at all levels to this overall purpose
3. Capturing and developing technical and personal/inter-personal skills
4. Developing and maintaining an adequate level of resources
5. Setting up suitable processes and procedures for common operational situations
6. Empowering operational teams
7. Identifying and putting effective leaders in place
8. Making the right information available to the right people at the right time
9. Maintaining a deep physical presence in the field
10. Developing and sustaining internal and external relationships
11. Eliminating silos and integrating the different parts of the organisation
12. Capturing insights from past operational failures and successes
13. Reflecting on past experiences and improving practices accordingly
14. Sharing the lessons throughout the organisation, across operations, and across the supply network.

On this basis, our research delineates agility in the humanitarian logistics context as an intricate concept made up of multiple interrelated elements that humanitarian organisations need to understand in order to be fully agile. As such a systems view of agility has, to date, not been explored empirically in the humanitarian logistics literature, this paper makes a significant contribution to the research on agility in the humanitarian logistics context.

The implications of this work are both research-oriented and practical. From an academic perspective, our study opens new areas of research by emphasising the need for academics to broaden the scope of their research and to move the study of agility from a narrow operational to a wider strategic focus. In other words, researchers should not limit their studies on agility to logistics matters and to immediate action, but should also concentrate on the strategic mechanisms supporting the ability to take immediate action and to conduct agile logistics operations. Taking a more comprehensive approach is all the more important as agility is needed not only to respond to short-term change and disruptive events in the field, but also to adjust rapidly to different supply chain environments, i.e. to move from one operation to another as effectively as possible.

In addition to having relevance to the humanitarian logistics research discipline, this paper has clear practical implications. In particular, leaders and managers of humanitarian organisations need to recognise that logistics skills and operational excellence are not the only determinants of agility, and that their decisions can positively or negatively impact on the supply chain agility of their organisation. In other words, logistics expertise (e.g. in warehousing, shipping, or fleet management) and operational capacity building (e.g. prepositioning) are important agility factors, but they are not sufficient and should be supported by organisational capacity building. Thus, the responsibility for building a system that enables field workers to be responsive (i.e. to identify and manage risks, uncertainties, and opportunities) and flexible (i.e. to adapt operations) lies with the highest levels of management and leadership. It follows that leaders should elevate agility to the strategic level of their organisations and develop an appropriate agenda for supporting field operations in turbulent environments. This includes the way the organisation is structured, provides clarity of purpose, makes decisions, (re-)deploys or secures access to resources, eliminates internal barriers, collaborates with other organisations involved in the relief effort, identifies and analyses best practices, and facilitates their sharing throughout the organisation.

Five limitations need to be considered in relation to this research. First, developing a coherent model that includes a comprehensive set of practices requires collecting data from different sources, i.e. different organisations. According to Pagell and Wu (2009) who use ten cases to study the concept of sustainability in supply chain management, this is because organisations differ in the way they operate (in relation to our research, in the way they create agility) and because an exhaustive bundle of best practices cannot be reflected in a single organisation. As a consequence, further investigation is called for to study the concept of agility in different organisational contexts.

Second, the case study selected solely uses one source of data collection (i.e. interviews). Although Yin (2003) argues that a large number of academic studies rely on a single source of evidence, he also contends that data triangulation (i.e. the collection of data from multiple sources) is more appropriate in order to corroborate findings and, therefore, develop a more compelling argument. Further studies should, therefore, attempt to replicate/refine/develop our research by using different sources of evidence. This includes, for example, quantitative data collected through the use of a survey questionnaire.

Third, this research is exploratory in nature and covers a large number of categories and sub-categories. It is, therefore, not possible to analyse each of these elements in depth and future

investigations should consider the contribution of each sub-category to agility in greater detail. Going one step further, content analysis is an ineffective method for scientifically establishing causal relationships (Berg, 2007). Therefore, there continues to be a need for measuring the capabilities and for quantifying the impact of organisational capacity building (i.e. the four strategic level capabilities) on field agility. Doing so will enable academics to move to the explanatory stage of research, i.e. to establish cause and effect relationships, and to better understand how the strategic and operational levels of a humanitarian organisation interact.

Fourth, since this research relies on a single case study, the findings are context-dependent and may not be fully applicable and transferable to other organisations. A previously explained, WFP was selected for its expertise in humanitarian logistics and, arguably, serves as a best practice reference point for humanitarian organisations. However, there is a large variety of humanitarian organisations and they do not form a homogeneous whole. They are not only very different in nature, but also in their motivation, size, scope of intervention, or modes of operations (Long and Wood, 1995; Kovács and Spens, 2007). For this reason, our findings should be understood in relation to WFP and, as previously mentioned, further investigations should be undertaken to extend this research to a wider range of humanitarian organisations.

That said, we argue that this research transcends its empirical context (i.e. WFP) and addresses issues that have a broader theoretical appeal. As explained by Ketokivi and Choi (2014), whilst contextual idiosyncrasies are an integral part of case-based research emphasising theory testing, a sense of generality follows from considerations that go beyond the framework of the study and are, therefore, of interest and applicable to other organisations.

Finally, as mentioned in the introduction, our research focuses on one part of L'Hermitte *et al.*'s (2015) model of agility, i.e. on the four strategic level capabilities. In other words, this paper does not directly study the specific role of the three sets of agility enablers (people, processes, and technology) also identified by L'Hermitte *et al.* (2015), although some linkages have been considered. Additional research is, therefore, needed in order to explore how these agility enablers underpin and support the four strategic level capabilities, and how these resources can be used in order to create and maintain agility and, ultimately, enhance the responsiveness and flexibility of humanitarian logistics operations.

7. Concluding comments

This research follows the lead of academic researchers who have investigated the concept of agility in a business context and concluded that the focus of agility needs to move from the operational to the strategic level of an organisation. In addition, this paper uses L'Hermitte *et al.*'s (2015) conceptual work and, in particular, the four strategic level agility capabilities (being purposeful, being action-focused, being collaborative, and being learning-oriented) which, according to these authors, enhance the agility of humanitarian logistics operations. Our research also draws on the contributions of the well-established research conducted in the business fields of agile manufacturing (e.g. Sherehiy *et al.*, 2007), agile software

development (e.g. Appelo, 2011), agile strategic management (e.g. McCann and Selsky, 2012), and agile supply chain management (e.g. Christopher, 2011) to identify the key elements that make up and enable the above capabilities. Having established the analytical framework, a case study of WFP and a qualitative content analysis of interviews with experts in the field of humanitarian logistics are used in order to gain a better understanding of the underlying mechanisms of agility in humanitarian logistics. This analysis provides evidence to support the relevance and the contribution of the four strategic level capabilities to humanitarian logistics agility.

Overall, this paper is the first empirical research that takes a strategic approach to the concept of agility in humanitarian logistics. It is, thus, anticipated that it will help the leaders and managers of humanitarian organisations to understand the underpinning factors in the development of logistics and supply chain agility and, especially, to understand that agility is a business-wide capacity that requires substantial managerial and leadership input and commitment. The research is also designed to assist leaders and managers in making more informed and effective decisions and, ultimately, in increasing humanitarian organisations' control over their logistics and supply chain operations.

Endnote

^[1] The Logistics Cluster is a coordination mechanism that enhances partnership, facilitates information sharing, and coordinates logistics activities among UN agencies and between UN agencies and other humanitarian organisations in order to achieve a better use of resources, to increase capacity, and to improve the quality of the response (Logistics Cluster, 2015a).

INVESTIGATING THE STRATEGIC ANTECEDENTS OF AGILITY IN HUMANITARIAN LOGISTICS

Cécile L'Hermitte

Australian Maritime College, University of Tasmania

Benjamin Brooks

Australian Maritime College, University of Tasmania

Marcus Bowles

Australian Maritime College, University of Tasmania

Peter Tatham

Department of International Business and Asian Studies, Griffith Business School

Abstract

This paper investigates the strategic antecedents of operational agility in humanitarian logistics. To this end, we identified the particular actions to be taken at the strategic level of a humanitarian organisation in order to support field-level agility. Then, we collected quantitative data (n=59) on four strategic level capabilities (being purposeful, action-focused, collaborative, and learning-oriented) and on operational agility (field responsiveness and flexibility). Using a quantitative analysis, we tested the relationship between organisational capacity building and operational agility and found that the four strategic level capabilities are fundamental building blocks of agility. They collectively account for 52% of the ability of humanitarian logisticians to deal with ongoing changes and disruptions in the field. This study emphasises the need for researchers and practitioners to embrace a broader perspective of agility in humanitarian logistics. It also highlights the inherently strategic nature of agility, the development of which involves focusing simultaneously on multiple drivers.

Keywords - Humanitarian logistics; Humanitarian supply chain; Agility; Strategic capabilities; Organisational capacity building; Risk management

1. Introduction

Humanitarian organisations operate in very volatile and dynamic environments. They must, therefore, be able to cope with the uncertainty, risk, complexity, and even unknown unknowns (truly unforeseeable events) that are inherent in field operations. Agility is the ability to respond to any of these challenges (Charles et al., 2010). However, in the humanitarian logistics context, dealing with changes and disruptions along the supply chain is often associated with field-level creative solutions (WFP, 2013b; d, 2014). Whilst ad hoc

problem-solving is, undoubtedly, valuable in order to cope with unpredictable events (Jahre et al., 2009), the general humanitarian literature indicates that a structured organisational approach is the key to successful risk management (Kent, 2011; Metcalfe et al., 2011). Similarly, in the more specialised humanitarian logistics literature, emergent research recognises that a systematic approach is essential to agility building (Tomasini and Van Wassenhove, 2009; Tatham and Christopher, 2014; L'Hermitte *et al.*, 2015). However, to date, these studies remain conceptual and the impact of strategic factors on the ability of humanitarian organisations to respond appropriately to operational disruptions has not been measured.

This study investigates the strategic antecedents of agility in the humanitarian logistics context and tests the extent to which a number of strategic elements (collectively referred to as organisational capacity building) impact on the ability of humanitarian organisations to overcome the ongoing changes and multiple disruptions encountered in the field. In other words, we explore what should be done at the strategic level of a humanitarian organisation to enhance responsiveness and flexibility in the field and, thus, to prevent anticipated and unexpected disruptive events from negatively impacting on humanitarian deliveries. By doing so, we address the following research question:

To what extent does organisational capacity building impact on operational agility in the humanitarian logistics context?

A quantitative approach was selected in order to measure this relationship. Thus, survey data were collected and analysed by using structural equation modelling that is suitable to test conceptual models including latent (non-observed) variables (Byrne, 2010). Our research demonstrates that there is a direct and significant relationship between organisational capacity building and operational agility, and it also explains how humanitarian organisations can create agility by building organisational capacity. Thus, this study contributes to extending the scope of the concept of agility in humanitarian logistics and to moving the primary focus in relation to this concept from operational considerations to strategic ones. In doing so, the paper addresses a significant limitation in the humanitarian logistics literature that is predominantly focused on operational matters.

The remainder of this paper is structured as follows. The next section presents an overview of the strategic and operational components of agility, as well as the model postulated in this research. This is followed by a section discussing the methodological aspects of our work. In the subsequent section, we identify the specific strategic decision-making areas that are most associated with operational agility and, on this basis, develop the measurement scales used in the study. Next, we use structural equation modelling to test the hypothesised relationships, before discussing the results of this analysis and identifying the limitations of our research. The final section examines the study's implications for research and practitioners.

2. The concept of agility in humanitarian logistics

2.1. The strategic and operational components of agility

Agility is represented in this paper as a multi-dimensional concept that consists of both strategic and operational components. At the strategic level, we draw on the work of L'Hermitte et al. (2015) who reviewed the literature on agility in a business context and, through this analysis, identified four strategic level agility capabilities relevant to the field of humanitarian logistics. However, these dimensions and their impact have, to date, not been quantitatively tested. The strategic level agility capabilities include:

- Being purposeful (the capacity to maintain a clear direction for humanitarian action),
- Being action-focused (the capacity to build readiness and marshal the organisation to respond to the risks, uncertainties, and opportunities encountered along the humanitarian supply chains),
- Being collaborative (the capacity to build and sustain relationships within and outside the humanitarian organisation in order to solve problems collaboratively),
- Being learning-oriented (the capacity to identify and capture past field experiences, to share them across operations, and to turn them into improved practices).

At the operational level, the components of agility include responsiveness and flexibility (L'Hermitte et al., 2015). Due to the ongoing uncertainty prevailing in the humanitarian environment, responsiveness and flexibility are repeatedly highlighted as two essential objectives pursued by agile humanitarian organisations (e.g. Charles et al., 2010; McGuire, 2011). Responsiveness is the ability to rapidly sense and identify operational risks and opportunities along the supply chain, as well as to swiftly draw up a suitable response. Thus, a responsive organisation quickly understands the nature, extent, and impact of the forces disrupting supply chain operations and makes speedy decisions to manage them.

A flexible organisation moves rapidly from identifying risks/opportunities and from planning a response to the execution phase, i.e. to taking action as necessary in order to prevent the disruptive forces from negatively impacting on humanitarian deliveries or to seize the possibilities arising along the supply chain. Thus, flexibility is defined as the ability to act in a timely manner and to swiftly adjust logistics operations.

Most importantly, responsiveness and flexibility complement each other. In other words, an organisation cannot be agile and quickly overcome contingencies without being both responsive and flexible (Shahabi et al., 2015). We, therefore, consider responsiveness and flexibility together and, in the framework of this paper, integrate them into the concept of operational agility.

2.2. Hypothesised relationships

As highlighted in the broader management literature (e.g. Goldman and Nagel, 1993; Redding and Catalanello, 1994; Dove, 1996; Roth, 1996; Gunasekaran, 1998; McCann and Selsky, 2012), agility stems from the interactions between a number of mutually reinforcing factors that, taken separately, are not sufficient. We, therefore, argue that the four above-mentioned strategic level capabilities are not only closely related to each other, but that they

also form an integrated whole that collectively reflects what should be done at the strategic level of an organisation in order to enable field workers to overcome disruptions or seize opportunities. Consequently, as illustrated in Figure 1, a latent variable (or factor) called organisational capacity building is modelled, and it is anticipated that this will account for the shared variance among the four strategic level capabilities. On this basis, we postulate that:

H1. *The four strategic level agility capabilities collectively reflect organisational capacity building.*

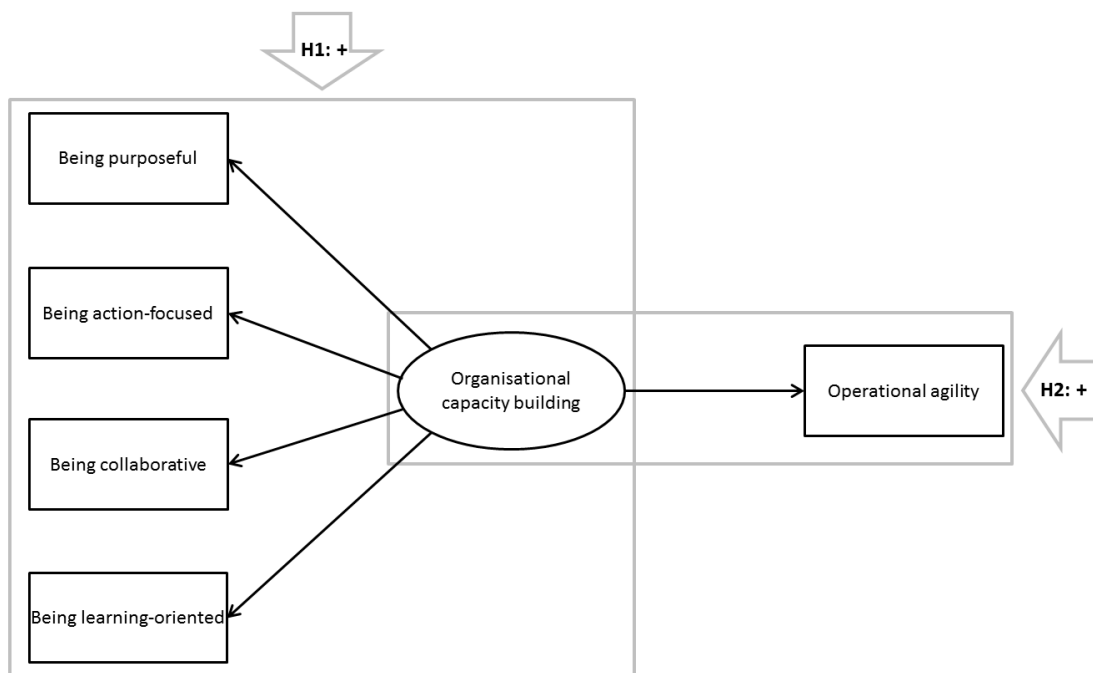


Figure 1: Theoretical model of agility in humanitarian logistics

The second underlying argument of this paper is that organisational capacity building (i.e. being purposeful, action-focused, collaborative, and learning-oriented) positively impacts on operational agility. In particular, being purposeful enables an organisation to develop and to maintain collective meaning and a strong identity that steer people towards a defined course of action and provide a clear direction to their work (Handler Chayes *et al.*, 1997; Appelo, 2011; McCann and Selsky, 2012). In the humanitarian context, this course of action is guided by the core humanitarian values and primary motivations of humanitarian organisations, i.e. saving lives and alleviating human suffering (ACMC, 2012). For these reasons, it is expected that being purposeful positively affects operational agility.

An action-focused organisation provides operational staff with a number of tools that enable them to deal appropriately with field contingencies. For example, field workers need to have access to up-to-date information, to be appropriately qualified, to have the right attitude, and to be able to rely on procedures and protocols that support swift action. All these elements

increase the ability of an organisation to manage field contingencies (Gatignon et al., 2010; Kruke and Olsen, 2012; Seal and Bailey, 2013). Therefore, we suggest that being action-focused enhances the agility of field operations.

Both internal and external collaboration have been recognised as essential components of supply chain agility in the business context. For example, according to Christopher (2011), collaboration enhances supply chain synchronisation, process alignment, and streamlined deliveries. In the humanitarian context, internal integration (i.e. across functions as well as between headquarters, country offices, and front-line staff) and external relationships (i.e. with other humanitarian organisations, local and national authorities, as well as commercial and military entities) enable humanitarian organisations to swiftly deploy the resources needed, to provide timely logistics services, and to increase the speed of aid distribution (Logistics Cluster, 2013b; Featherstone, 2014). Internal and external relationships also enable humanitarian organisations to rapidly adjust operations in order to prevent disruptive circumstances from negatively impacting on the distribution of humanitarian aid (WFP, 2013c). Therefore, being collaborative (internally and externally) is expected to contribute to operational agility.

Learning-oriented organisations support innovation at the field-level (e.g. non-routine problem solving), capture these experiences, share them across operations, evaluate actions on an ongoing basis, and engage in a process of continuous improvement. This not only helps field staff speed up their decision-making, but also enhances the organisation's anticipatory and adaptive capacity (Ramalingam et al., 2009). Therefore, being learning-oriented is expected to enhance the agility of field operations.

Following on from the above discussions, we suggest that organisational capacity building (that encompasses the four above-mentioned capabilities) increases field responsiveness and flexibility and we, consequently, hypothesise that:

H2. *Organisational capacity building positively impacts on operational agility.*

Figure 1 represents the postulated model. It shows that the four strategic level capabilities reflect organisational capacity building, and also depicts the positive impact of organisational capacity building on operational agility. In line with the standard symbol notation used in structural equation modelling (Hair *et al.*, 2006; Byrne, 2010), the arrows leading from the factor to the four strategic level indicators represent the factor loadings (i.e. the proportion of variance in each indicator explained by organisational capacity building), and the arrow leading from the factor to the outcome indicator represents the path coefficient, i.e. the direct effect of organisational capacity building on operational agility.

3. Methodological considerations

Based on the model presented in the previous section, five constructs need to be measured:

- Four predictors: being purposeful, being action-focused, being collaborative, and being learning-oriented,
- One outcome variable: operational agility.

To achieve this, multi-item measures were used. As argued by Churchill (1979), multi-item measures better represent the constructs and enable researchers to consider their multiple facets. In addition, multi-item indicators improve the reliability (consistency) as well as the validity of measurement, and increase the level of distinction among cases (i.e. generate greater variability) (Warner, 2013).

As recommended and/or performed in the academic literature (e.g. Eisenhardt, 1989; Vázquez-Bustelo et al., 2007), a step-by-step process was followed in order to identify the scale items used to delineate the constructs of this research and to collect data. Initially, scale items were derived from previous research, in line with the recommendation of Lounsbury et al. (2006). In particular, we drew on the comprehensive review of the literature on agility undertaken by L'Hermitte et al. (2015). Since they argue that leaders should simultaneously develop the agility capabilities across organisational levels, we framed the scales of the four above-mentioned strategic level capabilities to match the different levels of an organisation, i.e. individual, team, central, and supply network. By doing so, we aimed to provide a substantial coverage of the various dimensions associated with a particular construct and, thereby, increase the content validity of the scales (Warner, 2013).

The initial list of items to be measured was subsequently refined and/or items were reformulated on the basis of a content analysis of 29 interviews, each of some 40 minutes, which took place in June 2014 at the Rome headquarters of United Nations World Food Programme (WFP). The participants were selected with the advice of WFP's logistics senior management based on their extensive current or former experience in humanitarian logistics (over 10 years of experience for 27 of them), as well as their expected insights in relation to the concept of agility. At the time of the interviews, 24 participants held positions in WFP's logistics division and 5 in other departments (Policy, Programme and Innovation, Information Technology, Procurement, Emergency Preparedness). The job titles of the interviewees were varied but included logistics officer, logistics coordinator, logistics cluster officer, head of logistics, emergency preparedness and response officer, as well as director or deputy director.

Consistent with the multi-level approach to agility adopted in this research, the interview participants were WFP staff members working at various levels of the organisation, ranging from the operational to the strategic levels. In particular, 9 of the interviewees were current field workers visiting headquarters or former field workers who were interviewed in relation to their previous field experience. These field workers were involved in various operations including Pakistan, Afghanistan, Congo, Burkina Faso, and Senegal. Among the other interview participants, 9 were working at the Rome headquarters in functional positions (e.g. fleet management, shipping, information management), and 11 were working in middle or senior managerial positions.

The interview questionnaire is provided in Table 1. For further reference, the 29 interviews were qualitatively analysed in L'Hermitte *et al.* (2016).

Interview topic covered	Questions
General questions	When people talk about agility and about making WFP a more agile organisation, what do they mean?
	What actions are taken at the strategic level of the organisation to support the agility of logistics operations?
Being purposeful	In your opinion, is WFP an organisation with a clear purpose? Why?
	In your opinion, does a clear purpose lead to more responsiveness and flexibility in the field? If yes, how? If no, why?
Being action-focused	What does WFP do to ensure that field workers are able to take appropriate action on the ground?
Being collaborative	Which working relationships (internal and external) are essential for field workers to achieve responsiveness and flexibility on the ground? Why?
Being learning-oriented	Are there formal mechanisms in place at WFP to capture and to share learning from past operational failures and successes? If yes, which ones? If no, why?
	In your opinion, does organisational learning lead to more responsiveness and flexibility in the field? If yes, how? If no, why?

Table 1: Interview questions

The resultant 46 items, which were designed to serve as a basis for the collection of quantitative data, together with their sources, are presented in Table 2.

Construct	Code	Item measure	Organisational level	Main source
Being purposeful	P1	My organisation has a clear purpose	Central	McCann and Selsky (2012)
	P2	My organisation enhances its consistency of purpose by aligning goals and objectives across all levels	Central	McCann and Selsky (2012)
	P3	My organisation's processes and procedures are set up to achieve the overall purpose	Central	McCann and Selsky (2012)
	P4	I fully identify with my organisation's purpose	Individual	McCann and Selsky (2012)
	P5	My actions are guided by my organisation's purpose	Individual	McCann and Selsky (2012)
	P6	My team/group clearly understands what has to be done to fulfil the organisation's purpose	Team	Appelo (2011)
	P7	Partners across the supply chain share a sense of common purpose	Supply network	McCann and Selsky (2012)

Construct	Code	Item measure	Organisational level	Main source
Being action-focused	A1	I have the skills needed to meet the requirements of my position	Individual	McCann and Selsky (2012)
	A2	I feel confident in my ability to take the initiative as necessary	Individual	McCann and Selsky (2012)
	A3	My team/group has the necessary resources	Team	McCann and Selsky (2012)
	A4	My team/group is provided with suitable processes and procedures for dealing with common situations	Team	Interviews
	A5	My team/group is authorised to adapt processes and procedures when necessary	Team	Interviews
	A6	My organisation has an extensive field presence (including offices in remote areas)	Central	Interviews
	A7	My organisation has short and rapid decision-making lines and approval protocols	Central	McCann and Selsky (2012)
	A8	My organisation delegates authority and responsibilities to support action	Central	Appelo (2011)
	A9	My organisation has effective leaders in place who drive action	Central	Interviews
	A10	My organisation makes accurate <u>logistics</u> information available (e.g. track-and-trace information, availability of resources, etc.)	Central	Handfield and Nichols (2002)
	A11	My organisation disseminates <u>risk-related</u> information to assist decision-making in uncertain situations (e.g. political or weather risks)	Central	Interviews
	A12	My organisation disseminates <u>demand-related</u> information (e.g. what is needed, in which quantities, when, where) in a timely manner	Central	Christopher (2011)
	A13	My organisation provides the right information to the right people at the right time	Central	McCann and Selsky (2012)
	A14	Partners across the supply chain actively engage in information sharing (e.g. logistics data, predictive analysis, etc.)	Supply network	McCann and Selsky (2012)
	A15	Partners across the supply chain develop consistent policies and procedures to support their action	Supply network	Christopher (2011)
Being collaborative	C1	I maintain positive and active relationships with others <u>within</u> the organisation	Individual	McCann and Selsky (2012)
	C2	I maintain positive and active relationships with people <u>outside</u> the organisation	Individual	McCann and Selsky (2012)
	C3	My team/group is fully aware of the expertise of other units/divisions within the organisation	Team	Weick and Sutcliffe (2001)
	C4	My team/group actively collaborates with other units/divisions <u>within</u> the organisation to solve problems	Team	McCann and Selsky (2012)
	C5	My team/group actively collaborates with others <u>outside</u> the organisation to solve problems	Team	McCann and Selsky (2012)
	C6	My organisation has mechanisms in place to support trust and coordination between the different units/divisions	Central	McCann and Selsky (2012)
	C7	My organisation eliminates functional silos by supporting the integration of the different parts of the organisation	Central	Appelo (2011)
	C8	Partners across the supply chain have a clear understanding of the role and competencies of the different parties with which they are working	Supply network	McCann and Selsky (2012)
	C9	Partners across the supply chain work together to solve problems	Supply network	McCann and Selsky (2012)

Construct	Code	Item measure	Organisational level	Main source
Being learning-oriented	L1	I am committed to active learning and self-development	Individual	McCann and Selsky (2012)
	L2	I generate new insights and share information with others in the team/group	Individual	Bontis <i>et al.</i> (2002)
	L3	My team/group continuously learns from communicating with other units/divisions	Team	McCann and Selsky (2012)
	L4	My team/group reflects on past experiences and generates its own procedures based on best practices	Team	Redding and Catalanello (1994)
	L5	My organisation has mechanisms in place for identifying lessons from past operational successes and failures	Central	Garvin (1993)
	L6	My organisation translates the lessons from past experiences into improved and more relevant processes and practices	Central	Redding and Catalanello (1994)
	L7	My organisation shares best practices throughout the organisation and across operations	Central	Ramalingam <i>et al.</i> (2009)
	L8	Partners across the supply chain learn from each other	Supply network	McCann and Selsky (2012)
	L9	Partners jointly evaluate their performance in order to improve their future work	Supply network	Interviews
Responsiveness	R1	Ability to identify risks and opportunities along the supply chain	Operational	Manuj and Mentzer (2008)
	R2	Ability to quickly respond to operational risks and opportunities	Operational	Manuj and Mentzer (2008)
	R3	Ability to make fast decisions	Operational	Manuj and Mentzer (2008)
Flexibility	F1	Ability to reconfigure transport operations (e.g. to change transport modes or routes)	Operational	McGuire (2011)
	F2	Ability to adapt the delivery terms (e.g. range of products, volume, place, date, frequency)	Operational	Charles <i>et al.</i> (2010)
	F3	Ability to adjust the network of partners (e.g. suppliers of logistics services, military, etc.)	Operational	Chandra and Grabis (2007)

Table 2: Constructs, associated item measures, and related literature

In order to measure these items, data was collected through an online survey. The target population was humanitarian logistics practitioners with field experience. Participants were recruited with the help of WFP, of the Humanitarian Emergency Logistics Professionals (HELP) Forum of the Chartered Institute of Logistics and Transport in the United Kingdom (CILT UK), of individual humanitarian logisticians, and by posting the survey link on the Humanitarian Logistics Association's LinkedIn discussion group.

Participants were presented with the 46 above-mentioned items to be measured on a five-point Likert scale. Their level of agreement with the 40 first items (those associated with the strategic capabilities) was measured by the following rating scale: (1) strongly agree, (2) agree, (3) neither agree nor disagree, (4) disagree, and (5) strongly disagree. Their estimation of operational agility (the last six items) was measured by the following scale points: (1) very good, (2) good, (3) neutral, (4) poor, and (5) very poor.

A total of 67 responses of practitioners working for 11 organisations were collected between November 2014 and February 2015. 8 responses were excluded from the final analysis

because the cases contained more than 10% missing data (i.e. more than four missing values) and, according to Bennett (2001), such cases may distort the results of the statistical analysis. The remaining 59 cases were explored by conducting the Missing Completely At Random (MCAR) data test provided by Little (1988). This indicated that approximately 0.7% of the values were missing and that there was no evidence of a systematic pattern.

Table 3 presents the descriptive statistics for the 46 above-mentioned items. In particular, the table includes information regarding the statistical dispersion of the data, i.e. the range (the smallest and the largest values selected by the respondents), the mean (the average value), and the standard deviation (the average deviation from the mean) (Allen *et al.*, 2014).

Code	Range	Mean	Standard deviation	Code	Range	Mean	Standard deviation
P1	1-3	1.56	.565	C1	1-2	1.58	.498
P2	1-4	2.10	.736	C2	1-3	1.78	.559
P3	1-4	2.08	.877	C3	1-4	2.37	.849
P4	1-4	1.66	.757	C4	1-4	1.98	.601
P5	1-4	1.73	.691	C5	1-4	2.12	.672
P6	1-4	2.02	.754	C6	1-4	2.49	.878
P7	1-5	2.59	.893	C7	1-4	2.92	.836
A1	1-3	1.59	.529	C8	1-4	2.86	.899
A2	1-2	1.53	.504	C9	1-4	2.61	.743
A3	1-5	2.39	.929	L1	1-3	1.56	.565
A4	1-5	2.14	.840	L2	1-3	1.68	.539
A5	1-5	2.32	.860	L3	1-4	2.14	.601
A6	1-4	1.39	.616	L4	1-4	2.02	.682
A7	1-5	2.37	1.015	L5	1-5	2.36	.924
A8	1-5	2.02	.841	L6	1-5	2.80	.943
A9	1-5	2.37	.927	L7	1-5	2.64	.961
A10	1-5	2.32	.955	L8	1-5	2.76	.916
A11	1-4	2.29	.832	L9	1-5	3.05	.818
A12	1-5	2.46	.857	R1	1-4	2.00	.830
A13	1-5	2.68	.860	R2	1-4	1.88	.790
A14	1-5	2.93	1.032	R3	1-4	1.98	.881
A15	1-5	2.88	.911	F1	1-3	1.76	.652
				F2	1-5	2.07	.828
				F3	1-5	2.12	.911

Table 3: Descriptive statistics

To analyse the collected data, we tested the internal consistency of the scales and conducted a structural equation modelling analysis.

4. Scale reliability and composite measures

4.1. Operational agility

Assessing the extent to which the items are linked to and measure the underlying construct is essential in order to avoid measurement errors and to ensure that consistent results are

generated (Warner, 2013). Thus, the internal consistency of our scales was assessed by conducting a reliability analysis that consisted of calculating the Cronbach's alpha estimates (α) and considering the corrected item-to-total statistics. The corrected item-to-total statistics assess the level of correlation between each item and the sum of the remaining items included in the scale (Allen et al., 2014), and are therefore designed to determine which elements should be retained in or discarded from the scale (Lounsbury et al., 2006).

The resultant Cronbach's alpha value associated with operational agility ($\alpha=.829$) exceeds the recommended level of .700 (Streiner et al., 2015). This value, that indicates that 82.9% of the variance is shared across the six items included in the scale, would not be higher if any of the six items making up the scale were to be discarded. The corrected item-to-total correlation levels related to operational agility are also satisfactory (from .558 to .690), i.e. $>.400$, as recommended by Lounsbury et al. (2006). This confirms the reliability of the scale and supports the computation of a composite score for operational agility. We, therefore, produced an aggregate of the six individual items included in the operational agility scale.

4.2. Levels of association between the strategic level items and operational agility

Since the strategic decision-making areas presented in Table 2 have, to date, not been tested empirically, the level of bivariate correlation between each of these elements and operational agility was considered by running a Spearman's rank correlation test. Doing so enabled us to identify which items generate the highest levels of variability in relation to operational agility and, thus, to identify which items are strongly associated with the outcome variable. The levels of correlation between the 40 strategic level items and operational agility are reported in Table 4.

In order to identify the most statistically significant levels of bivariate correlation between these individual items and operational agility, we selected the 22 items significant at the .01 level (**). These items were used to compute the four strategic level composite indicators. Since the 22 individual items showing significant correlation levels with operational agility reflect all strategic level capabilities, the correlation analysis confirms that the four capabilities play a role in agility building, a finding that is confirmed by the structural equation analysis conducted later in this paper.

P1	P2	P3	P4	P5	P6	P7
.467**	.428**	.427**	.508**	.307*	.433**	.435**

A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15
.195	.105	.066	.263*	.461**	.150	.537**	.464**	.456**	.466**	.391**	.492**	.550**	.429**	.331*

C1	C2	C3	C4	C5	C6	C7	C8	C9
.327*	.159	.327*	.122	.225	.572**	.475**	.343**	.417**

L1	L2	L3	L4	L5	L6	L7	L8	L9
.215	.231	.206	.306*	.445**	.497**	.310*	.253	.520**

Notes:

Spearman's Rho coefficients; *p<.05; ** p<.01; n=59

Table 4: Correlation matrix between the strategic level items and operational agility

4.3. Strategic level indicators

As argued by Lounsbury et al. (2006), considering the item validities of a scale, i.e. the level of correlation between each item and the outcome variable, and using this information to make decisions about which items to retain or delete, increases the predictive validity of the scales in relation to the outcome variable. Thus, in order to increase the validity of our research, we used the 22 above-mentioned items (i.e. those showing the highest level of correlation with operational agility) to develop the scales of the four strategic level indicators.

We followed the previous approach to test the reliability of these scales. The Cronbach's alphas were $\alpha=.803$ for being purposeful, $\alpha=.880$ for being action-focused, $\alpha=.822$ for being collaborative, and $\alpha=.765$ for being learning-oriented. However, a closer examination of the statistics revealed that the relative Cronbach's alphas of two scales (being purposeful and being action-focused) could have been improved if the following items were discarded:

- P7: Partners across the supply chain share a sense of common purpose
- A14: Partners across the supply chain actively engage in information sharing.

As doing so would not have improved the consistency of the two scales significantly and, also, as the P7 and A14 items are considered neither ambiguous nor irrelevant to the rest of the scale items, they were both retained in their respective scales. In addition, the corrected item-to-total correlation levels are adequate for the four strategic level scales, which confirms the internal reliability of these scales and supports the computation of composite scores. Therefore, we aggregated the items and created composite measures for the four strategic level capabilities. Altogether, the five composite indicators computed (operational agility and the four strategic level capabilities) form the basis for the structural equation analysis undertaken in the next section.

5. Testing the hypothesised relationships

5.1. Data examination and preparation

To ensure the robustness of our analysis, the assumptions of structural equation modelling were tested. Among these, and in order to ensure that 'careless responses' were not included in the survey data (Meade and Craig, 2012), we conducted a multivariate outlier analysis by using the Mahalanobis distance that is designed to detect unusual combinations of scores (Allen et al., 2014). This provided a maximum score of 18.467. Since the maximum Mahalanobis distance calculated for the cases in the data set was 10.458 (i.e. below the critical value), we concluded that our data are free of multivariate outliers and, thus, free of 'careless responses'.

In addition, we assessed the level of normality in the distribution of our data by calculating the skewness and kurtosis statistics (see Table 5), and by considering the graphic representations of the five composite measures previously computed.

Variable	Mean	SD	Skewness	s.e.	Kurtosis	s.e.	1	2	3	4	5
Being purposeful	2.003	.547	.641	.311	.328	.613					
1. Being purposeful (LOG10)	.286	.118	-.061	.311	-.232	.613	1.000				
2. Being action-focused	2.409	.609	.410	.311	-.455	.613	.679**	1.000			
3. Being collaborative	2.720	.679	.161	.311	-.636	.613	.702**	.723**	1.000		
4. Being learning-oriented	2.707	.588	.150	.311	-.760	.613	.655**	.660**	.773**	1.000	
5. Operational agility	1.969	.602	.229	.311	-.293	.613	.642**	.653**	.555**	.599**	1.000

Notes:

SD=Standard Deviation; s.e.=standard error; ** p<.01 (two-tailed); n=59

Table 5: Descriptive statistics and sample correlations

This analysis revealed that the data in respect of being purposeful was skewed. To normalise the data, the scores were mathematically transformed by using the LOG10 transformation method recommended by Tabachnick and Fidell (2007). The descriptive statistics for the five constructs of this research, as well as the sample correlations, are reported in Table 5.

5.2. Structural equation modelling

We used structural equation modelling and the maximum likelihood estimation method of IBM SPSS AMOS (version 22) to test both the first hypothesis (related to the construct validity of organisational capacity building) and the second hypothesis (regarding the structural relationship between organisational capacity building and operational agility). The results of this analysis are presented in Table 6. In particular, the estimates (four factor loadings and one path coefficient), their respective standard errors (s.e.), and their measures of significance (t) are reported.

	Estimate	s.e.	t	Standardised estimate
Factor loadings				
Being purposeful <--- Organisational capacity building	.095	.013	7.332***	.813
Being action-focused <--- Organisational capacity building	.501	.066	7.556***	.830
Being collaborative <--- Organisational capacity building	.587	.072	8.157***	.871
Being learning-oriented <--- Organisational capacity building	.488	.064	7.660***	.837
Path coefficient				
Organisational capacity building ---> Operational agility	.430	.070	6.165***	.721

Notes:

*** p<.001

$\chi^2=7.985$ for 5 DF and a p-value of .157; $\chi^2/DF=1.597$; SRMR=.032; GFI=.950; CFI=.983; RMSEA=.101

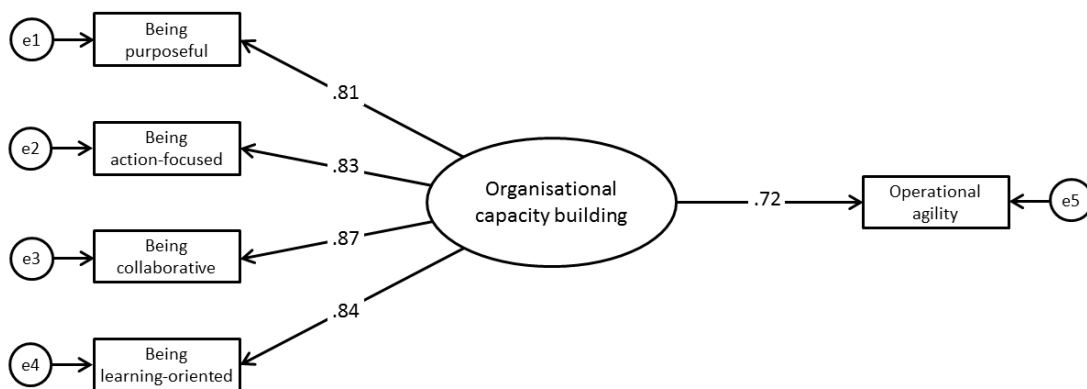
n=59

Table 6: Model output

The t-values of the four factor loadings exceed 1.96 and have a level of significance below the .001 level. This confirms that being purposeful, being action-focused, being collaborative, and being learning-oriented appropriately reflect organisational capacity building. In addition, as illustrated in Figure 2, each indicator has a strong standardised factor loading ranging from .81 to .87, providing clear indications of the significant relationships between the four strategic level capabilities and organisational capacity building. In other words, the four strategic level capabilities are appropriate measures of the underlying construct. In addition, as organisational capacity building accounts for the shared variance among the four indicators, these results demonstrate that the strategic level capabilities are not only strongly related to organisational capacity building, but also strongly related to one another.

The direct path from organisational capacity building to operational agility is also found to be positive and statistically significant. The standardised coefficient of .72 provides evidence that increasing organisational capacity building has a substantial impact on increasing operational agility. This is confirmed by the squared multiple correlation associated with operational agility (obtained by squaring the path coefficient, i.e. $.722 = .52$), which indicates that organisational capacity building accounts for 52% of the variance in operational agility. This clearly demonstrates that operational agility is significantly influenced by the strategic level dimensions.

The goodness-of-fit indices reported in Table 6 indicate that the model provides a good fit to the data. In particular, the chi-square (χ^2) statistic of 7.985 with 5 degrees of freedom (DF) and a p-value of .157, i.e. $>.05$, indicates that our model is operating adequately. Other fit indices, i.e. the normed chi-square (χ^2/DF), the standardised root mean square residual (SRMR), the goodness-of-fit index (GFI), and the comparative fit index (CFI) are also within the commonly accepted standards reported by Schumacker and Lomax (2010). Whilst the root mean square error of approximation (RMSEA) is high (i.e. $>.08$), Browne and Cudeck (1992) consider that a statistic below a .1 threshold is still acceptable, whilst Byrne (2010) argues that a high RMSEA value may lead to the rejection of a true model if the sample size is small (as is the case for the sample size of this research).



Notes:

All standardised residual covariances $<.5$

Figure 2: Structural equation model's standardised estimates

Overall, our findings validate the hypothesised model and confirm the multi-dimensional and multi-level nature of agility in a humanitarian logistics context. In other words, an agile organisation not only exhibits various characteristics (it is purposeful, action-focused, collaborative, learning-oriented), but also builds agility at all levels of the organisation (i.e. beyond the operational level).

6. Discussion

The above-mentioned results support the two hypotheses previously formulated. In particular, the data support the first hypothesis, i.e. that being purposeful, being action-focused, being collaborative, and being learning-oriented jointly reflect organisational capacity building and play a collective role in the creation of agility. Thus, it can be concluded that agility does not stem from one particular driver but from a combination of strategic level forces that are closely intertwined and must be developed simultaneously. The second hypothesis, which related to the positive impact of organisational capacity building on operational agility, is also validated. This confirms that agility transcends operations and stems from the close interactions between the strategic and the operational levels of a humanitarian organisation.

These results are consistent with the research conducted in a number of management fields. For example, our findings regarding the positive role of purpose in achieving agility confirm the research on agile project management that highlights that a clear mandate, a shared vision, and a value-driven culture trigger meaningful operational results (Appelo, 2011). Our results in relation to the positive contribution of being action-focused to operational agility are also in line with the work undertaken by a number of management authors (e.g. Redding and Catalanello, 1994) who argue that building a constant state of readiness is critical to organisations operating in turbulent environments because it enhances the organisation's ability to proactively and reactively manage and overcome risks and uncertainties. In particular, our research is consistent with studies conducted in the field of emergency management. For example, Somers (2009) argues that local autonomy is necessary to deal with complexity, and that it leads to increased flexibility and quicker responses. Emergency management situations also require organisations to achieve adequate information and resource allocation, and to prepare people to become problem-solvers (Dynes, 1994).

The positive influence of collaboration on supply chain agility found in this research also supports previous studies conducted in a commercial (e.g. Christopher, 2011; Gligor and Holcomb, 2012a) as well as in a humanitarian context (Tatham and Christopher, 2014; Saavedra and Knox-Clarke, 2015) by demonstrating that sustaining internal and external relationships and working together are essential to deal with complexity and turbulence and to carry out smooth supply chain activities. In addition, our findings support existing research on organisational learning since intra- and inter-agency learning has long been recognised as critical in order to improve operations and to adapt to the multiple and ongoing disruptive forces encountered in the humanitarian environment (Van Brabant, 1997; Ramalingam *et al.*, 2009).

However, the originality of our work is that it combines the four strategic level capabilities into a single framework and, by doing so, demonstrates that organisational capacity building positively affects operational agility. In other words, the four strategic level capabilities are empirically confirmed as strategic antecedents of operational agility in humanitarian logistics. Going one step further, our research is the first in the humanitarian logistics literature to quantify the impact of organisational capacity building on operational agility, i.e. to provide evidence that 52% of the ability of field workers to swiftly and appropriately manage supply chain contingencies depends on strategic level forces. The other 48% might

be explained by operational drivers such as postponement (Oloruntoba and Gray, 2006) or prepositioning of supplies (Beamon and Balcik, 2008), as well as by external factors such the ability of seaports/airports to handle increased volumes of cargo and/or the ability of national authorities to escort humanitarian convoys to avoid pilferage (L'Hermitte et al., 2014). Clearly, these elements are important but we do not explore them in greater detail because they have already been documented in the humanitarian logistics literature and do not constitute the focus of the current paper.

Rather, the focus of this research is to emphasise that operational expertise is not sufficient to achieve supply chain agility. In other words, to be agile, a humanitarian organisation should not only develop logistics expertise (e.g. in warehousing, fleet management, and shipping), but it should also supplement these operational skills with a higher level ability to respond to change and challenges. Doing so is essential not only because humanitarian organisations need to respond to multiple complexities and dynamics existing in field operations, but also because they have to be able to shift easily from one operation to another and adapt swiftly to a new set of operational circumstances. Thus, this research underlines the importance of building organisational capacity in order to maintain a certain level of performance while adapting to both short term challenges and over time changes.

The main contribution of this study is to empirically and quantitatively assess the impact of organisational capacity building on field-level agility and, consequently, to provide evidence that researchers and practitioners need to embrace a more comprehensive perspective of agility in humanitarian logistics. Going one step further, this research provides a way forward for the development of organisational capacity by translating the capabilities into operating reality and providing a list of practical and actionable elements (see Table 2) that leaders of humanitarian organisations can consider in order to create purposeful, action-focused, collaborative, and learning-oriented organisations.

In doing so, this paper builds the foundations of a new theory of agility in humanitarian logistics, i.e. it not only establishes and quantifies the relationship between organisational capacity building and operational agility, but also explains how organisational capacity building can be developed. According to Christensen and Carlile (2009), this approach, based on understanding/measuring a phenomenon of interest as well as explaining the causes leading to the outcome, reflects the descriptive and prescriptive facets of theory building. Such a theory-building approach is essential because the humanitarian research is in need of sound theoretical frameworks that not only promote further research, but also inform practice (Jahre *et al.*, 2009; Dijkzeul *et al.*, 2013).

7. Limitations

Four limitations should be considered in relation to this research. Firstly, perception measures, rather than objective measures were collected. According to Conway and Lance (2010), it is important to explain why measuring perceptions is appropriate in the framework of a particular research investigation. Although some authors such as Beamon and Balcik (2008), Davidson (2006), and McGuire (2011) have developed quantitative measures of performance in the field of humanitarian logistics, it is suggested that these measures might

only be useful to evaluate the performance of a specific operation or to compare operations in similar environments. In other words, they might not be applicable to the overall operational performance of an organisation because the circumstances of each operation are specific and different. For example, the evaluation of delivery times provides different results in different environments because operations differ in terms of the distances travelled, the condition of the infrastructure along the supply chain, and/or the topography of the affected areas. For this reason, subjective measures based on the perceptions of experts and on their overall experience in humanitarian logistics operations are more appropriate in relation to the research undertaken in this paper. Most importantly, the survey participants were specialists in humanitarian logistics with extensive experience (approximately 54% of the respondents have been working in humanitarian logistics for over 10 years, and an additional 27% for 6 to 10 years). This not only suggests that the subjective respondents' responses may align with objective measures, but this also increases the validity and reliability of our research.

Secondly, given that the purpose of this research is to investigate the strategic antecedents of agility in humanitarian logistics, the strategic level constructs (i.e. the four capabilities) are studied in greater detail than the operational components of agility. In other words, the number of items measuring responsiveness and flexibility is limited compared to the number of items measuring the four strategic level capabilities.

Thirdly, the relatively small sample size of this research should be considered. The structural equation model presented in Figure 2 includes 10 parameters to be estimated (four factor loadings, one path coefficient, and the five error variances of the composite indicators). Since a number of authors (e.g. Bentler and Chou, 1987; Kline, 2005) consider that 5-10 cases per estimated parameter is appropriate (in particular when factor loadings are strong, as is the case in this research), our sample size of 59 cases seems adequate. However, a ratio of 5.9 cases per estimated parameter is clearly at the lower end of the 5-10 range. In addition, it has been repeatedly argued in the literature that structural equation modelling requires a large sample size (Hair et al., 2006), and that the model estimates and the goodness-of-fit statistics may be under- or over-estimated by an insufficient number of cases (Wolf et al., 2013). Further studies should, therefore, attempt to increase the sample size when replicating/refining this research.

Finally, since the survey participants were not recruited directly, no overview of the population is available for this study. Therefore, the response rate is unknown and it is not possible to determine if the sample size is statistically representative of the population. In order to increase control on the survey data, future research could consider replicating this study within a single organisation or a number of specific organisations.

Notwithstanding the above-mentioned research limitations, this paper confirms the relevance of a systems approach to the concept of agility, as further explained in the next section.

8. Conclusion and implications

This study takes a systemic view of agility in order to investigate how strategic efforts and the development of an agile system can help humanitarian organisations better anticipate,

adapt to, and overcome field-level contingencies. More specifically, this paper studies the nature of the strategic support needed by field logisticians to swiftly deal with disruptive forces, to eliminate/mitigate the negative impact of such events, and to leverage the benefits of positive changes.

Strategic factors have already been recognised as being critical to humanitarian logistics operations (Pettit and Beresford, 2009) and to the development of agility (Tatham and Christopher, 2014) but, to date, the extent to which they contribute to the creation of agility has been unclear. This paper attempts to remedy this deficiency and, thereby, extends the work already conducted on agility in the humanitarian logistics discipline. To achieve this, we empirically tested the impact of four strategic level capabilities (being purposeful, being action-focused, being collaborative, and being learning-oriented) on operational agility and established that the ability of field logisticians to be fully responsive and flexible depends on the capacity of the strategic level of their organisations to create an enabling environment.

Thus, our investigation is not only valuable for researchers, but also for practitioners. In particular, it is anticipated that this study will help humanitarian organisations and their leaders recognise that agility is a multi-dimensional concept as well as better understand how to manage field-level complexities and dynamics. Agility stems from the interplay between multiple strategic drivers and involves focusing simultaneously on a variety of instruments in an active, systematic, and consistent manner. In other words, agility is not related to a particular isolated practice, but is embedded in an integrated system, the ultimate objective of which is to support field workers and, thereby, achieve the seamless delivery of humanitarian supplies.

Most importantly, agility starts at the highest level of a humanitarian organisation and requires a system-wide and aligned approach that includes the way the organisation is structured, instils a sense of purpose, makes decisions, assigns responsibility, allocates resources, manages information, develops policies, connects the different parts of the organisation together, collaborates with other organisations, learns from experiences, processes knowledge, etc. Thus, agility is fundamentally strategic. Since the four strategic level capabilities collectively explain 52% of operational agility, it is essential that leaders of humanitarian organisations have a clear understanding of what should be done. To this end, Table 2 provides a list of specific elements that can guide leaders in making decisions about how to support the ability of field workers to overcome disruptive forces. This pool of actions defines the four capabilities at a level of detail not previously achieved in the humanitarian logistics literature, and also provides the basis for a clear line of concrete activities that will enhance the achievement of the four capabilities.

The list of items presented in Table 2 also confirms that people, processes and technology are essential agility enablers (L'Hermitte *et al.*, 2015). Thus, humanitarian organisations need to develop their resources and make investments in a number of areas, including information technology as well as skills and expertise. For example, making timely and accurate logistics information available requires using a track-and-trace information system. Along the same lines, sharing best practices throughout the organisation and across operations requires expertise in the development of collective and participatory projects that will bring field

logisticians together and encourage them to share their experiences in a real-time and interactive environment.

In addition to highlighting the importance of technology and skills, Table 2 also points to the need to establish appropriate structures and processes in order to support responsive and flexible field operations. For example, suitable processes are essential for dealing with common field situations. Appropriate decision making processes are also needed in order to support swift action.

Thus, the list of items presented in Table 2 is designed to make leaders of humanitarian organisations aware of the variety of mechanisms underlying the development of the four capabilities and, ultimately, the building of agility. However, the level of achievement of each of these items will, inevitably, differ from one organisation to another. This is because each organisation is different, and because not all organisations have reached the same level of agility and/or have emphasised the same mechanisms to develop their agility. Therefore, it is recommended that the 40 strategic level items included in Table 2 are considered individually by each organisation in order to determine which of them has already been achieved, and which need to be further developed. This will help humanitarian organisations assess the reality of their current performance in terms of agility and the achievement of the four capabilities.

In particular, these 40 elements can be used and operationalised to answer the following questions:

- Does the executive level of the organisation recognise the four strategic level capabilities as essential?
- Is there general acceptance at all levels of the organisation that these capabilities have to be developed?
- Are policies and processes in place to measure and assess the achievement of these capabilities?
- What is the organisation's level of achievement of each of the items presented in Table 2?
- What are the areas of improvement?
- Are policies, processes and actions in place to fill the gaps?

These questions clearly demonstrate that building agility is a slow and ongoing process, and that a long-term and culturally-oriented perspective is needed. In particular, building agility requires a change in behaviour, i.e. a change in what individuals at all levels of the organisation do, as well as a change in the way they think and they work. In other words, agility is inherently cultural and building it is a shared responsibility. Most importantly, developing agility requires a deliberate approach and the commitment of the leadership team which has the responsibility for building the agile system that supports the operational level of the organisation. It is, therefore, essential that the leaders of humanitarian organisations listen to those in the field, understand their needs in terms of responsiveness and flexibility, explore the extent to which field staff are provided with the appropriate tools, and develop the necessary strategic drivers. The participation of front-line workers is also critical as they need to actively search for new ways of doing things and improving practices, and actively share their experiences in order to contribute to the development of the whole organisation.

Doing so will enable humanitarian organisations to move from ad hoc creativity to internal capacity building in order to respond to the multiple field contingencies and to adapt to changing operational environments. This is all the more important as humanitarian crises have become more complex and dynamic and this, in turn, requires humanitarian organisations to develop more structured anticipatory and adaptive capacities (Kent, 2011).

Since the academic study of agility in humanitarian logistics is still at its early stage, this study provides the basis for further investigating the concept in a more systemic and integrated way, and for developing new theoretical propositions about what makes a humanitarian organisation an agile organisation.

SUPPLY CHAIN AGILITY IN HUMANITARIAN PROTRACTED OPERATIONS

Cécile L'Hermitte

Australian Maritime College, University of Tasmania

Peter Tatham

Department of International Business and Asian Studies, Griffith Business School

Benjamin Brooks

Australian Maritime College, University of Tasmania

Marcus Bowles

Australian Maritime College, University of Tasmania

Abstract

Purpose - The purpose of this paper is to extend the concept of agility in humanitarian logistics beyond emergency operations. Since the humanitarian logistics literature focuses primarily on emergencies and sees longer-term and regular operations as being conducted in relatively stable and predictable environments, agile practices are usually not associated with humanitarian protracted operations. Therefore, this paper explores the logistics and supply chain environment in such operations in order to identify their basic features and determine if agility is an important requirement.

Design/methodology/approach - Using a case study of the United Nations World Food Programme, we collected and analysed qualitative and quantitative data on the characteristics of protracted operations, the risks and uncertainties most frequently encountered, their impact, and the ways that field logisticians manage contingencies.

Findings - Our research demonstrates that unpredictability and disruptions exist in protracted operations. Therefore, short-term operational adjustments and agile practices are needed in order to support the continuity of humanitarian deliveries.

Research limitations/implications - Future research should focus on a wider range of humanitarian organisations and move from a descriptive to a prescriptive approach in order to inform practice. Notwithstanding these limitations, our study highlights the need for academics to broaden the scope of their research beyond emergencies and to address the specific needs of humanitarian organisations involved in longer-term operations.

Originality/value - This paper is the first empirical research focusing exclusively on the logistics features of humanitarian protracted operations. It provides a more concrete and complete understanding of these operations.

Keywords - Humanitarian logistics; Humanitarian supply chain; Protracted operations; Agility; Disaster recovery; Risk management

Article classification - Research paper

1. Introduction

Logistics has been repeatedly recognised by both academics (Tatham and Christopher, 2014) and practitioners (WFP Logistics, 2013) as a key to the success of humanitarian operations. In disaster environments, logistics activities are frequently conducted in highly volatile conditions and when transporting, storing and delivering relief items, humanitarian organisations encounter multiple risks and uncertainties. This includes unpredictable demand (when, where and in what quantities the humanitarian goods will be needed), uncertainty in supply, non-existent and/or damaged infrastructure, inadequate logistics resources, volatile political situations, security issues, as well as insufficient information (Everywhere *et al.*, 2011; L'Hermitte *et al.*, 2014). Humanitarian organisations need to be able to respond promptly to these uncertain and/or changing circumstances, and to adapt their operations to the requirements of the field environment swiftly and effectively. In other words, they need to be agile organisations (Charles *et al.*, 2010; L'Hermitte *et al.*, 2015).

Agility is the ability to develop and maintain operational responsiveness and flexibility in order to manage sudden and short-term logistics and supply chain risks and uncertainties. Thus, responsiveness (the ability to sense and identify operational risks and to swiftly draw up suitable responses) and flexibility (the ability to act in a timely manner and to adjust logistics operations rapidly) are seen as two essential components of agility (L'Hermitte *et al.*, 201x).

That said, humanitarian organisations are involved in a great diversity of operations, not least because no two disasters are the same (Tatham and Pettit, 2010; Beresford and Pettit, 2012) and because different disaster situations call for different intervention types (Holguín-Veras *et al.*, 2012). Such interventions range from emergency responses in the immediate aftermath of a disaster in order to help those affected cope with the basic human necessities, to recovery operations where longer-term humanitarian assistance is provided in order to return life back to normality, and to long-running development programmes aimed at increasing resilience (Kovács and Spens, 2007). Whilst there is broad agreement that emergencies generate the highest level of uncertainty and require agile practices to cope with multiple disruptions (Tatham and Christopher, 2014), the applicability of agility to other types of humanitarian operations has not been widely discussed in the literature. Rather, academics tend to study the applicability of lean and optimisation principles to the post-emergency phase of disasters and do not see agility as a sustainable requirement in longer-term humanitarian operations (Cuzzolino *et al.*, 2012). And yet, since humanitarian environments are typically characterised by a significant level of contextual complexity and dynamism (Long and Wood, 1995), considering the extent to which supply chain agility is actually needed beyond the emergency phase of a disaster seems appropriate and relevant.

This paper focuses on the concept of protracted operations that are longer-term and regular humanitarian operations usually conducted in the recovery phase of a disaster. They are characterised by the absence of immediacy and by the availability of sufficient planning and preparation time (L'Hermitte *et al.*, 2014). In contrast, emergency responses refer to situations where lives are under immediate threat and, thus, require that action is taken without delay. The aim of our research is to investigate the logistics environment of protracted operations in order to determine the extent to which agility is needed (or not

needed) in this context. To this end, we will understand why agility is required in humanitarian logistics and supply chain operations by categorising the risks and uncertainties disturbing field operations. We will also identify the main logistics features of humanitarian protracted operations and, in particular, investigate if the risks and uncertainties previously identified are encountered in such operations and if operational adjustments are needed to overcome/mitigate disruptions. On this basis, we will determine if agile practices are a requirement in protracted operations. Thus, our investigations are guided by the following research questions:

RQ1. Why is agility needed in humanitarian logistics operations?

RQ2. What are the logistics characteristics of humanitarian protracted operations?

RQ3. Are agile practices required in humanitarian protracted operations?

Descriptive research was conducted in order to address these questions. More specifically, we collected both qualitative and quantitative data in order to provide a deeper insight into the logistics environment of protracted operations, and to demonstrate that agile logistics and supply chain strategies are not only required in emergencies but also in the protracted context.

The remainder of this paper is structured as follows. Section 2 explores the concept of humanitarian protracted operations. Section 3 focuses on agility and the reasons why supply chain agility is needed. Section 4 addresses the methodological approach of our research before the results are reported in Section 5. Section 6 discusses the key findings and Section 7 presents the contributions of our work. Section 8 addresses the research limitations and the opportunities for further investigations before the last section provides concluding comments.

2. Humanitarian protracted operations

2.1. Defining protracted operations

In the humanitarian logistics literature, the concept of protracted operations is not commonly used. Rather, authors refer, among other things, to regular humanitarian logistics operations (Holguín-Veras *et al.*, 2012), continuous aid operations (Buatsi *et al.*, 2007), operations in uninterrupted environments (McLachlin *et al.*, 2009), or recovery/reconstruction operations (Kovács and Spens, 2007). Table 1 recaps the various definitions provided by the above-mentioned authors.

Terms used	Sources	Definitions
Regular humanitarian logistics operations	Holguín-Veras <i>et al.</i> , 2012	'Operations in which the main purpose is either long-term recovery or humanitarian assistance' (p. 498).
Continuous aid operations	Buatsi <i>et al.</i> , 2007	'Humanitarian logistics in continuum, or strategic relief operations that aim at continuous development and sustenance of life of the vulnerable societies' (p. 4).
Operations in uninterrupted environments	McLachlin <i>et al.</i> , 2009	'Uninterrupted environments are reasonably stable in terms of political and economic conditions; logistics infrastructure is in place; and all the actors (customers, suppliers, service providers, and employees) are on the stage' (p. 1051).
Recovery/reconstruction operations	Kovács and Spens, 2007	'Different operations can be distinguished in the times before a disaster strikes (the preparation phase), instantly after a disaster (the immediate response phase) and in the aftermath of a natural disaster (the reconstruction phase)' (p. 101). 'The third phase is related to reconstruction and it involves long-term rehabilitation' (p. 105).

Table 1: Related terms used in the literature

A number of academics also discuss humanitarian operations conducted in response to slow-onset (and, thus, foreseeable) disasters (Van Wassenhove, 2006), and suggest that predictability enables the humanitarian intervention to be planned ahead (Apte, 2010). It has, however, been clearly demonstrated that the speed of onset does not necessarily determine the time available for preparation and action, and that humanitarians may have to employ an emergency intervention strategy even in the context of disasters predicted far in advance, as was the case in the 2011-2012 Somali food crisis (L'Hermitte *et al.*, 2014).

That said, researchers generally agree that there is a differentiation between humanitarian operations characterised by urgency vs. those with a long-term orientation. In this paper, the latter is encapsulated by the term 'protracted operations', a concept that covers both responses to anticipated disasters that allow for planning and preparation, and responses in the recovery phase of a disaster. Therefore, we define humanitarian protracted operations as longer-term operations in response to disaster situations that are anticipated and/or planned for.

Protracted operations are, arguably, characterised by the absence of immediacy and/or by regular delivery patterns that allow for longer response times and for a more established and repetitive approach to the flow of goods (L'Hermitte *et al.*, 2014). Protracted operations are, nevertheless, not expected to be smooth and free of the multiple disruptions that impede the assistance efforts. This is because humanitarian organisations typically operate in countries where, among other things, insecurity prevails, administration and business practices are inefficient, the infrastructure is not appropriately developed or has been destroyed, and/or the logistics capacity is inadequate (Vaillancourt and Haavisto, 2015).

It should be noted that protracted operations are not the same as continuous development programmes that aim to achieve profound transformations in order to reduce poverty and increase the resilience and self-reliance of communities living in developing countries (Stephenson, 1994). Thus, whilst both protracted operations and development programmes aim to deliver humanitarian aid on a longer-term basis and must be supported by robust logistics solutions, humanitarian goods are delivered in response to a disaster in the case of protracted operations, and in response to endemic and structural vulnerabilities in the case of development programmes.

2.2. *Protracted operations in the humanitarian logistics literature*

Despite recognising that there are different types of humanitarian operations and that each of them is conducted in a different environment with unique characteristics (Holguín-Veras *et al.*, 2012), the humanitarian logistics literature does not widely discuss protracted operations. Rather, the research to date has primarily focused on responses to sudden emergencies (Kovács and Spens, 2011a). More specifically, in their review of the humanitarian logistics literature, Kunz and Reiner (2012) found that only 11 of the 174 papers reviewed (i.e. 6%) focused on continuous aid aspects compared with 86% discussing emergency disaster relief. Likewise, only 10 papers dealt with the reconstruction phase of a disaster. Similar conclusions are drawn by Altay and Green III (2006) who reviewed the disaster management literature and identified 109 articles in the field of operations research and management science. Among those, only 11 (i.e. 10%) focused on the recovery phase of disasters.

As a consequence, longer-term and regular operations remain under-reported in the literature just as they are regularly omitted from media coverage (Wisner and Gaillard, 2009), possibly because sudden spectacular disasters are more likely to capture interest than long-lasting events (Alexander, 2005). Notwithstanding the limited information available, some of the logistics characteristics of protracted operations can be found in the literature. In particular, Holguín-Veras *et al.* (2012) touch on what they call ‘regular humanitarian logistics operations’ that relate to either longer-term recovery or to development work. These authors argue that such operations are carried out in relatively predictable, stable and organised (even though challenging) environments, and they note a number of similarities with commercial logistics operations. These relate to, for example, the regularity and repetitiveness of the flow of supplies (which enables logisticians to focus on operational optimisation and efficiency), the availability of structured operational and decision-making processes, the possibility of forecasting demand with reasonable accuracy, and/or the proper performance of logistics networks. Despite these similarities, clear differences between regular humanitarian logistics and commercial logistics exist and, consequently, Holguín-Veras *et al.* (2012) position regular humanitarian logistics as being halfway between commercial logistics and emergency humanitarian logistics.

Along the same lines, Giroux *et al.* (2009) differentiate emergency situations (where standard supplies are pushed down the supply chain based on the perceived needs of beneficiaries) from protracted operations where goods can be pulled through the supply chain and regularly replenished based on the assessment of actual demand. However, Giroux *et al.* (2009) highlight the point that local circumstances may be unstable, and even well-

established and regular supply chain operations may need to be adjusted rapidly in response to sudden disruptions.

Venkatesh *et al.* (2013) also contrast the supply chain operations conducted in immediate disaster relief with those conducted in the context of continuous aid (protracted disasters or development programmes), and conclude that the higher level of stability in the case of continuous aid operations allows for a greater degree of operational control.

2.3. Supply chain practices and strategies applicable to protracted operations

When the logistics and supply chain practices applicable to protracted operations are discussed in the humanitarian logistics literature, such operations are mostly associated with strategies of efficiency and operational optimisation. This is, mainly, because longer planning horizons are available (Kovács and Spens, 2009). In addition, cost minimisation and efficiency improvements are more easily achieved in the recovery phase of a disaster than in the early stage of an emergency when speed is essential (WFP, 2004b; Pettit and Beresford, 2005). Along the same lines, van der Laan *et al.* (2009) argue that the configuration of humanitarian supply chains differs if organisations are involved in disaster emergencies or in more predictable post-emergency environments where humanitarian needs become more visible and the overall operational environment becomes more stable and predictable. Thus, the focus shifts from speed (i.e. making humanitarian items available within days) in emergency situations to increased efficiencies based on repetitive deliveries in post-emergency environments. However, van der Laan *et al.* (2009) note that even recurrent deliveries conducted in post-emergency contexts are characterised by a certain level of instability and unpredictability. This is due, in particular, to inherent complexities in the contextual environment and to inefficiencies internal to the humanitarian organisations themselves, such as inaccuracies in stock records (van der Laan *et al.*, 2009).

Going one step further, Cozzolino *et al.* (2012) consider the applicability of lean and agile principles to the different phases of disaster relief. In their opinion, whilst agility is essential in emergency operations, lean practices consistent with those used in the commercial environment may be applicable to protracted operations. Taking a slightly different approach, Hughes (2009) explains that lean and collaborative supply chains are more suitable before a disaster occurs and that agile/fully flexible supply chain management is necessary in the emergency/survival response phase. Subsequently, a combination of collaborative, lean and agile practices is suitable in the rebuilding and restoration phase of a disaster.

In summary, the academic literature on the logistics aspects of protracted operations is limited and the applicability of agility to these operations is not clearly established. Before addressing these points, the next section considers the concept of supply chain agility in greater detail.

3. The concept of supply chain agility

3.1. Supply chain agility in the humanitarian logistics literature

The humanitarian logistics literature repeatedly argues that supply chain agility is an essential requirement in disaster relief operations. For example, Charles *et al.* (2010) contend that flexibility, responsiveness, and effectiveness are essential components of agility and enable humanitarian organisations to respond to the high level of uncertainty existing in relief supply chains. A number of authors go into the specific mechanisms underlying the creation of agility. For instance, Tatham and Kovács (2010, 2012) argue that swift trust supports effective humanitarian responses by enabling highly diverse actors to coordinate their action in a timely fashion. In parallel, Oloruntoba and Gray (2006) consider the concept of postponement as a way to cope with instability in humanitarian operations. More precisely, they argue that humanitarian organisations can be agile by maintaining the relief supplies in a generic form as far downstream in the supply chain as possible until more accurate and reliable information about the needs of beneficiaries is available to convert generic stocks into products specifically meeting those needs. This approach is taken one stage further by Tatham *et al.* (2015) who discuss the use of three dimensional printing in the humanitarian context and, thereby, exemplify the concept of postponement.

According to Kovács and Tatham (2009), humanitarian organisations can prepare for emergencies and create agility by appropriately configuring their resources and, in particular, their physical resources (e.g. pre-positioning inventory) and their human resources (e.g. maintaining rosters of experts). Scholten *et al.* (2010) highlight the critical role of technology in achieving network integration and, ultimately, agility in emergency relief supply chains. Thompson *et al.* (2006) also focus on information technology in humanitarian operations and argue that decision support systems facilitate swift task assignment and resource allocation in rapidly changing decision making environments. Likewise, Altay and Labonte (2014) contend that information management and information exchange are the keys to successful humanitarian responses because relevant and timely information supports effective flows of goods, inter-organisational coordination, and appropriate decision making. Altay and Pal (2014) consider the cluster approach as an effective way to generate higher quality information and to speed up its diffusion. As a consequence, clusters improve coordination and support prompter humanitarian responses (Altay and Pal, 2014).

Other analyses (Altay, 2008; Dubey *et al.*, 2015; Dubey and Gunasekaran, 2016) do not only focus on the concept of agility but, by drawing on Lee's (2004) work, study the related concepts of adaptability and alignment in response to the uncertainties and changes inherent in humanitarian logistics operations. According to the above-mentioned authors, agility is a response to short-term changes, whereas adaptability relates to more structural, medium-term changes. Alignment is about coordinating the interests of the various participants to the supply network in order to optimise the overall performance of the supply chain.

Supply chain resilience is another concept related to that of agility. Resilience, that has been widely studied not only in the business literature (Christopher and Peck, 2004; McCann *et al.*, 2009; Ponomarov and Holcomb, 2009), but also in relation to disasters (Zobel, 2009; Scholten *et al.*, 2014), refers to the ability of a system to resist and absorb disruptions and changes. Thus, whilst both concepts are closely related, resilience is about the robustness of

a system and its ability to swiftly recover to its original state, whereas agility defines the ability of the same system to respond to short-term turbulence by anticipating disruptions and changes, and by moving quickly in order to avoid, as much as possible, any negative consequences on the humanitarian flows of goods.

The current paper focuses solely on agility and does not study the concepts of adaptability, alignment, and resilience. Beyond the fact that investigating all the above concepts would be beyond the scope of a single study, this paper focuses on sudden and short-term disruptions, uncertainties and changes encountered in the field, as well as on the need to rapidly draw up suitable responses and adjust logistics operations. These elements reflect the concept of agility rather than those of adaptability, alignment, and resilience.

Although agility is focused on short-term changes and uncertainties, a long-term organisational approach to the concept is certainly needed. Thus, according to Dubey and Gunasekaran (2016), operational reactivity and the effectiveness of short-term relief action are dependent on the development of long-term organisational capacity. In a similar way, Altay and Green III (2006) note that, in a disaster environment, timely responses and continuity require the development of a disruption management system designed to deal with a high level of turbulence, to protect routine operations and to support rapid operational restoration. Although Park *et al.* (2013) do not focus on humanitarian organisations, but on business organisations affected by unexpected and large-scale events causing major supply chain disruptions, the relevance of their work in relation to the current paper lies in the highlighted importance of building inherent capabilities within the organisation itself in order to overcome and recover from severe disruptive events. In particular, robust information systems, coordination and collaboration with key suppliers, and the development of substitution strategies (i.e. supply chain portability) are key elements supporting the restoration process (Park *et al.*, 2013).

A strategic approach to the concept of agility in humanitarian logistics is also taken by Tomasini and Van Wassenhove (2009), Tatham and Christopher (2014), and L'Hermitte *et al.* (2015) who argue that supply chain agility and the ability of humanitarian organisations to organise rapid responses transcend the logistics function and require a business-wide approach as well as the development of deep-rooted capabilities. In the same way, Fawcett and Fawcett (2013) contend that, due to the extreme level of complexities and uncertainties inherent in humanitarian operations, a comprehensive perspective to the design of humanitarian systems is needed. Specifically, Fawcett and Fawcett (2013) suggest a move from temporary supply chains designed to respond to specific disaster situations to more permanent infrastructures based on ongoing planning and coordination. This more comprehensive approach to agility reflects the research conducted in a business context and, in particular, in the field of manufacturing. For example, Vinodh *et al.* (2010) present agility as a complex concept that is reflected in 20 dimensions as diverse as organisational structure, the nature of management, the involvement of employees, and IT integration. On these grounds, Vinodh *et al.* (2010) argue that agility requires management inputs, workforce contributions, as well as advanced technology.

The above studies provide clear indications that agility enables humanitarian organisations to adapt to uncertainty and to sudden and unanticipated changes that prevent the achievement

of a smooth and continuous flow of goods. Ultimately, agility enables humanitarian organisations to swiftly provide life-saving assistance to the people affected by a disaster (Scholten *et al.*, 2010), i.e. to improve the human performance of humanitarian organisations (Dubey *et al.*, 2015). However, in the literature, agility is seen as an essential requirement in the framework of emergency operations. Clearly, humanitarian organisations deal with the highest level of uncertainty and turbulence when an unpredictable, sudden and highly destructive event occurs, as was the case in Nepal in April 2015. In such disaster situations, uncertainties and complexities result from unanticipated and rapidly changing demand patterns, deliveries that are extremely difficult to plan, a large number of heterogeneous partners taking part in the supply chain operations, a widespread level of infrastructure destruction, and a lack of information (Beamon and Balcik, 2008).

Whilst, as explained in Section 2, the level and the pace of turbulence are, obviously, less acute in protracted operations, such operations are not free of uncertainties, complexities and disruptions. In order to better understand the nature of the constraints and challenges encountered in protracted operations and, therefore, to gain a deeper insight into the logistics environment of these operations, it is necessary to investigate why supply chain agility is actually needed.

3.2. Understanding why supply chain agility is needed

Supply chain agility prevents operational volatility (i.e. multiple changes and unpredictable events along the supply chain) from disrupting the continuity of the logistics and supply chain flows (Prater *et al.*, 2001; Christopher, 2011). Therefore, understanding why supply chain agility is needed requires an insight into the nature of the risks and uncertainties that humanitarian organisations are likely to encounter in field operations.

Whilst the previous section demonstrates that supply chain agility is repeatedly discussed in the humanitarian logistics literature, the volume of research on humanitarian supply chain risk management is limited (Larson, 2011) and, in particular, clear categories of risks and uncertainties encountered along the humanitarian supply chains remain to be empirically established and tested (L'Hermitte *et al.*, 2015). In this respect, the broader supply chain literature provides relevant insights as well as a structured understanding of the challenging and constraining factors that can negatively impact on logistics and supply chain operations. Thus, according to Manuj *et al.* (2007), adverse events can be categorised into supply risks, operations (or process) risks, demand risks, and security risks.

Supply risks and uncertainties relate to issues around supplier reliability, capacity and quality that can result in the disruption or interruption of supply. This includes, for example, the inadequate quality of the goods supplied, late and/or partial deliveries, supplier failure, etc. Operations/Process risks and uncertainties are internal to an organisation and prevent it from producing/delivering the goods or services as requested (in terms of time, quantity, quality, and cost). Such risks originate from, among other things, the use of inappropriate technology, inadequate procedures, and an unsuitable level of skills. Demand risks and uncertainties are associated with outbound supply chain operations, i.e. with customers. Sources include variations in demand, i.e. in volume and/or in the range of goods requested,

as well as the lack of demand visibility. Security risks and uncertainties are external threats that negatively impact on supply chain operations. They are as diverse as terrorism or intellectual property violations (Manuj *et al.*, 2007).

Along the same lines, Christopher and Peck (2004) differentiate between the following three risk categories: internal to the organisation, external to the organisation but internal to the supply network, and external to the supply network (i.e. contextual). A similar approach is taken by Pfohl *et al.* (2011) who categorise supply chain risks as those within a given focal company (e.g. in relation to processes and/or inappropriate decisions leading to processing delays), those related to suppliers (for example, the loss of a key supplier) and customers (such as demand fluctuations), and those outside the supply chain (e.g. natural disasters or terrorist attacks). Wagner and Neshat (2010) also study the sources of supply chain vulnerability related to the supply and demand sides as well as those resulting from the structure of the supply chain itself. In this regard, they note that global supply chains (i.e. across national boundaries, as is often the case of humanitarian supply chains) are more vulnerable and require a higher level of coordination of the flows of goods and information. Figure 1 illustrates the different levels of risk and uncertainty sources as described in the business supply chain literature.

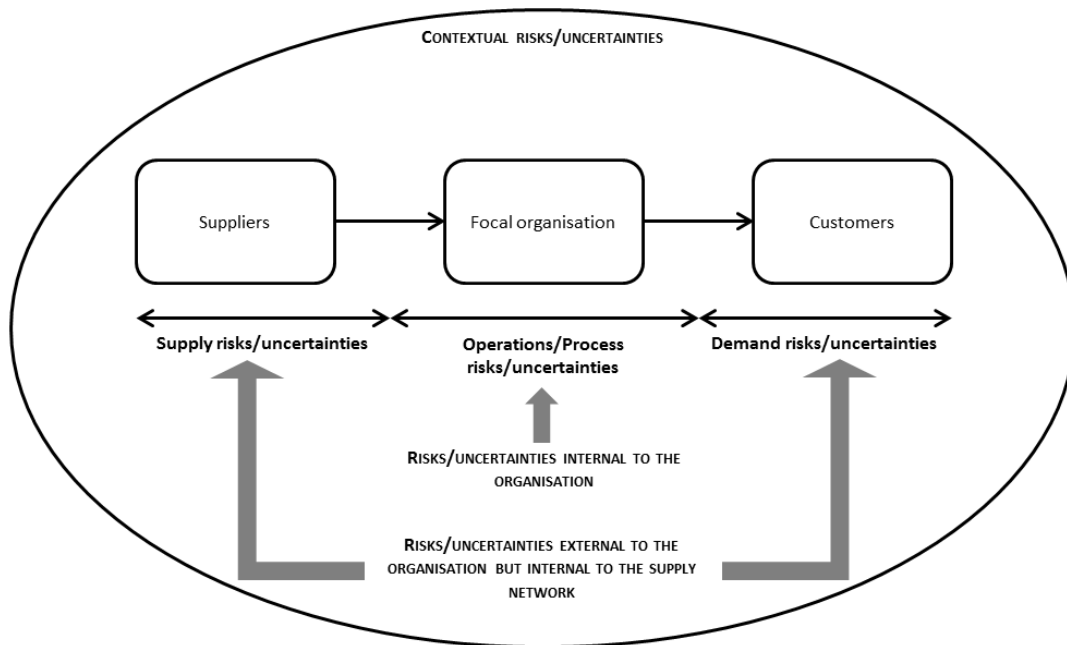


Figure 1: Risk and uncertainty impacting on supply chain operations
(adapted from Christopher and Peck, 2004; Manuj *et al.*, 2007; Pfohl *et al.*, 2011)

Commercial businesses mainly deal with demand, supply and process risks and uncertainties (Van der Vorst and Beulens, 2002). In this context, Christopher *et al.* (2006) argue that agility is particularly suitable to an environment of unpredictable demand with short

response times. Humanitarian organisations typically operate in these conditions given the uncertainty generated by a disaster, e.g. where it will strike and what its magnitude will be. These unknown factors make planning extremely complicated in terms of timing (When will supplies be needed?), location (Where will they be needed? From where should they be shipped?), relief nature (What supplies will be needed?), volume (How much assistance will be needed?), and operating mode (How will aid be delivered?) (Van Wassenhove, 2006).

Contextual (also called macro-environmental) risks and uncertainties are widely studied in the business supply chain literature but these external risks are frequently categorised as catastrophic and/or isolated events disrupting supply chains (such as the 9/11 terrorist attacks or the 2011 earthquake/tsunami in Japan), rather than external disruptions that occur on an ongoing basis. This approach to externalities can be explained by the fact that, unless they do business in developing countries, commercial organisations do not normally have to manage challenges such as non-existent or damaged transport infrastructure, explosive devices on land delivery routes, insufficient or inadequate logistics expertise or services, underdeveloped information technology, violent political turmoils, corrupt officials, or armed groups practising extortion. However, humanitarian organisations repeatedly experience some or all of the above challenges and, as a result, have to cope with a variety of risks and uncertainties in the macro-environment.

L'Hermitte *et al.* (2014) identify a set of five macro-environmental/contextual factors that may negatively impact on humanitarian logistics operations. These relate to the physical elements in the disaster environment (e.g. weather or topography), the socio-economic setting, governmental decisions, security issues, and infrastructure problems. Altay (2008) also identifies a number of sources of macro-environmental/contextual complexity and uncertainty in humanitarian logistics, including the insecurity prevailing in most humanitarian environments, ethical risks (e.g. corruption), and political risks (such as the lack of understanding and cooperation between humanitarians and the military).

Despite repeatedly considering the above macro-environmental factors, the current humanitarian logistics literature primarily studies agility in response to supply chain-related risks and uncertainties, i.e. in relation to demand, supply and processes (L'Hermitte *et al.*, 2015). This is mainly because these analyses draw on the business literature on agility and, as mentioned above, contextual risks and uncertainties occur to a lesser extent in the commercial environment.

Whilst unknowns and contingencies are an integral part of any humanitarian operation, the scale and scope of the above-mentioned sources of risk and uncertainty are different if the humanitarian organisation is involved in an emergency operation or in a longer-term recovery operation (Blecken, 2010b). For example, demand, supply and process uncertainties are inevitable in the immediate aftermath of a disaster because any new disaster leads to the configuration of a time-specific, ad hoc supply chain (Merminod *et al.*, 2014), and because goods are needed immediately, supply has to be swiftly organised, and new processes need to be set up (Ertem *et al.*, 2010). However, in the post-emergency phase, demand, supply and processes tend to be better articulated and established, making the management of the supply chain more predictable (Maiola, 2007). Thus, the nature of the

risks encountered and the resultant design of a particular humanitarian supply chain depend on the disaster stage in which humanitarian organisations operate (Altay, 2008).

The remainder of this paper focuses on gaining a better understanding of the above-mentioned risks and uncertainties in the context of protracted operations. To this end, the conceptual model presented in Figure 1 serves as a guide to identify the challenging and constraining factors and collect risk-related data on protracted operations.

4. Methodology

Kovács and Spens (2011b) argue that researchers should gain a true understanding of the reality of field operations and conduct practice-oriented research in humanitarian logistics. To this end, we collected empirical data on protracted operations and used a descriptive approach to make sense of these data. As noted by Saunders *et al.* (2009), descriptive research is undertaken when a clearer picture of the studied phenomenon is needed, i.e. a description is necessary for the researcher to be able to assess a situation, as is the case in our study. Indeed, since the literature on humanitarian longer-term operations is limited, describing those operations as well as their logistics environment seems to be an appropriate first step. Thus, this research aims to gather information about, and obtain a more accurate picture of, the characteristics of protracted operations. Subsequently, the descriptive data are analysed to assess if agility is needed in these operations. In this sense, the descriptive data are used as a precursor to explanation (Saunders *et al.*, 2009).

To complete this work, case study research is undertaken. This methodology has been selected because it is helpful to conduct research in a real-life context and, by limiting the scope of the study, to identify meaningful characteristics of the studied phenomena (Yin, 2003), i.e. humanitarian protracted operations. In this research, the unit of analysis is the United Nations (UN) World Food Programme (WFP). As the UN agency that specialises in food assistance, WFP strives to provide the ‘right food to the right people at the right time’ (WFP, 2010, p. 3). In 2014, WFP delivered 3.2 million metric tons of food to 80 million people in 82 countries (WFP, 2015h). In contrast to many humanitarian organisations which distinguish field operations on the basis of disaster relief or development programmes, WFP differentiates between three types of operational environments: emergency operations, protracted operations, and development operations. Emergency operations are designed to provide immediate and urgently needed assistance in the aftermath of a disaster (WFP, 2015b). WFP’s development operations go beyond temporary food aid and aim to assist communities in addressing endemic poverty problems and in achieving long-term food security (WFP, 2015a). In order to bridge the gap between immediate disaster relief and long-term development, WFP has developed a third category of operations called Protracted Relief and Recovery Operations (PRROs). PRROs aim to assist the affected communities in re-establishing their livelihoods in disaster recovery settings and/or protracted crises such as a long-term refugee crisis (WFP, 2004a, 2015e). In the remainder of this paper, we will refer to PRROs as protracted operations. Over the course of 2014, WFP was involved in 57 such operations. By comparison, WFP conducted 39 emergency operations and 27 development projects over the same period of time (WFP, 2015h).

Thus, WFP was selected because it expressly conducts protracted operations, and this enabled us to focus our data collection and analysis on these particular operations. The key features distinguishing WFP's protracted operations are described in Table 2.

Areas of interest	Key features
Operational focus	The operational focus is on self-reliance, the improvement of households' livelihoods, and the recovery of local economies (in contrast, saving lives is emphasised in emergency operations)
Supply	Local procurement and purchases (for food and logistics resources) are emphasised
Food distributions	Beneficiaries of food distributions are better targeted in order to improve nutrition (in contrast, general food distributions are more frequent in emergency operations)
Type of assistance provided	Less direct deliveries of food are needed and are, when possible, replaced by cash/voucher assistance
Local partners	The use of locally implemented partners is emphasised
Supply chain integration	Coordination/partnership with other humanitarian organisations is expanded
Budget flexibility	More flexibility exists in the reallocation of protracted operations' budgets, which enables field workers to better plan for contingencies and, ultimately, to deal more appropriately with rapid changes and surges in humanitarian needs

Table 2: Key features of WFP's protracted operations (adapted from WFP, 2004a)

In line with Yin's (2003) recommendation regarding data collection in case studies, different sources of evidence (i.e. qualitative and quantitative) were used. Mixed methods are increasingly recognised as complementary and leading to better research outcomes in social sciences. In particular, whilst qualitative research is used to describe the phenomena studied and provide a narrative support, quantitative data add precision and a numerical quantification (Johnson and Onwuegbuzie, 2004). Thus, following Jick's (1979) recommendation, this research capitalises on the respective strengths of qualitative and quantitative research. As a first step, qualitative interview data are collected and used to better understand the logistics and supply chain environment of protracted operations and to provide insights into what may disrupt the deliveries of humanitarian supplies. In a second stage, gathering and analysing quantitative survey data enables us to investigate more precisely the nature of the disruptions and constraints encountered in protracted operations, as well as their logistics consequences.

In this research, qualitative data were collected by means of five semi-structured interviews of 30 to 60 minutes conducted in June 2014 at WFP's Rome headquarters. Since interview participants were selected on the basis of their ability to provide the most relevant research information, the interview sampling was purposive (Saunders *et al.*, 2009). In particular, three logistics officers and two heads of logistics were recruited with the help of WFP's logistics management on the basis of their expertise (logistics officers are in charge of the day-to-day field logistics activities and heads of logistics are responsible for designing, planning, supervising and leading WFP's logistics operations in their respective country offices), their extensive experience in humanitarian logistics (each individual participant has more than 10 years of experience), and their involvement in protracted operations. In particular, the participants work/have worked, among others, in Senegal, Burkina Faso, Congo and/or Afghanistan, as will be reflected in the interview results presented in the next section. It should, however, be noted that these countries do not constitute units of analysis for the case approach since, as mentioned earlier, the focus of our study is WFP and the data collected reflect WFP logisticians' overall experience in relation to protracted operations.

The interview questions (provided in Table 3) were framed in order to explore the level of (in)stability in protracted operations, the nature of the disruptions/constraints encountered in the field, their impacts on logistics operations, as well as the methods used to overcome them. A qualitative content analysis of the transcribed interview data was subsequently undertaken based a manual approach that enabled us to identify the relevant excerpts. More specifically, a colour system was used, i.e. different colours were associated with the various topics covered in the interviews. Next, each transcript was carefully reviewed and the relevant units of analysis highlighted in the appropriate colour in order to make them easily identifiable and facilitate data analysis.

Interview topic covered	Interview questions
General operational environment	How stable/turbulent is the operational environment of protracted operations?
Nature of disruptions/constraints	What kind of disruptions/constraints do you encounter (have you encountered) in protracted operations?
	What is the degree of predictability of these disruptions/constraints?
Impact on logistics operations	What is the impact of these disruptions/constraints on logistics operations?
Dealing with disruptions/constraints	How are disruptions/constraints overcome in protracted operations?
	To what extent is agility (responsiveness and flexibility) needed in protracted operations?

Table 3: Interview questions

In addition to the qualitative interview data, quantitative data were collected through an online survey of WFP's field logisticians currently/previously involved in protracted operations. The survey questionnaire followed the framework of the interview questions (general characteristics of protracted operations, nature of disruptions/constraints, impact on logistics operations, and mitigation practices). The relevant literature (especially, Blecken *et al.*, 2009; Charles *et al.*, 2010; McGuire, 2011; Holguín-Veras *et al.*, 2012; L'Hermitte *et al.*, 2014) as well as the text content of the above-mentioned interviews were used to frame the survey questions. In respect to the disruptions/constraints encountered in protracted operations, data were collected on the two following generic categories:

- Contextual disruptions/constraints (this category relates to the risks and uncertainties external to the supply network, i.e. the macro-environmental risks and uncertainties presented in Section 3.2),
- Supply chain-related disruptions/constraints (this category encompasses the risks and uncertainties internal to the organisation, as well as those external to the organisation but internal to the supply network, as presented in Section 3.2).

The survey involved five questions related to protracted operations (three matrix questions using 5-point Likert scales and two multiple choice multiple select questions). These questions formed the fourth (and last) section of a comprehensive survey focusing on the concept of agility in humanitarian logistics. The online questionnaire was sent by WFP's logistics division to some 200 logistics staff members. In order to target the logisticians being/having been involved in protracted operations, we set up a branching logic with a source question (*Are you working or have you previously worked in the field in a PRRO?*). Respondents answering yes to this question were given access to the fourth section of the questionnaire. A total of 23 respondents completed it from November to December 2014. Respondents were international logistics officers (60%) and national logistics officers (40%). 13 of them had been working for WFP for over 10 years, 9 for 6 to 10 years, and 1 for 3 to 5 years. The quantitative data collected were subsequently analysed by aggregating the results in Microsoft Excel and presenting them in the form of tables and charts. The survey questions are provided in Table 4.

Survey questions	Associated statements/choices
To what extent do you agree or disagree with the following statements regarding PRROs?	<ul style="list-style-type: none"> - Demand patterns are stable - Delivery lead times are regular - The network of supply chain participants (suppliers, implementing partners, etc.) is well established - Timely and accurate logistics information is available (e.g. inventory levels, physical position of the goods, etc.) - Supply chains are demand-driven (i.e. supplies are pulled through the supply chain) - Order fulfilment processes are well established
<p>Based on your past experience, which of the following contextual disruptions/constraints are the most frequent in PRROs?</p> <p><i>Please tick the 3 MOST FREQUENT contextual disruptions/constraints.</i></p>	<ul style="list-style-type: none"> - Physical (e.g. weather, typography, etc.) - Security (e.g. conflict, pilferage, etc.) - Infrastructure (e.g. roads, ports, communication, etc.) - Socio-economic (e.g. logistics resources, skills, fuel prices, etc.) - Government (e.g. inefficient administration, corrupt practices, etc.) - Other, please specify
<p>Based on your past experience, which of the following supply chain-related factors are the most constraining/disruptive in PRROs?</p> <p><i>Please tick the 3 MOST FREQUENT supply chain-related sources of constraints/disruptions.</i></p>	<ul style="list-style-type: none"> - WFP's business processes and standard procedures - Functional silos within WFP - Funding and in-kind donations - Unpredictable demand for humanitarian supplies - Suppliers of food and other items - Suppliers of logistics services - Implementing partners - Commercial partners (e.g. TNT, UPS, Maersk, etc.) - Other, please specify
Do contextual and supply chain disruptions/constraints have the following impacts on logistics activities in PRROs?	<ul style="list-style-type: none"> - Access restrictions - Operational bottlenecks - Capacity constraints (warehousing and/or transport) - Delayed deliveries - Stock-outs - Partial or total loss of cargo (e.g. pilferage) - Supplies not fit for purpose (e.g. damaged, deteriorated, close to or beyond expiry date) - Cost increases beyond anticipated budget - Skill shortages - Other, please specify
How are operational disruptions/constraints mitigated/overcome?	<ul style="list-style-type: none"> - By adapting field operations (e.g. changing delivery locations, transport modes, transport routes, etc.) - By deviating from the agreed internal business processes and standard procedures - By securing support from the regional bureaux - By requiring support from other teams/groups within WFP Logistics (e.g. stand-by partners, shipping, etc.) - By requesting support from other divisions within WFP (e.g. information technology, procurement, etc.) - By cooperating with other organisations (humanitarian, governmental, commercial, and/or military) - Other, please specify

Table 4: Survey questions

5. Key findings

5.1. Interview results

The transcribed text contents of the interviews provide an overview of the logistics environment of humanitarian protracted operations. In order to provide a narrative support to the interview raw data and, in turn, increase the validity of our research, we have integrated excerpts of the interviews into the overall discussions conducted below. The numbers attached to the quotations reflect the codes assigned to each interviewee in order to anonymise the data.

5.1.1. Disruptions and constraints encountered in the field

The interview data demonstrate that uncertainties and disruptions are part of the supply chain environment of humanitarian protracted operations. Thus, *‘in protracted operations, we do have situations that can disturb the regular business, such as a local flooding that doesn’t create additional beneficiaries but disturbs the operations’* (#3). Some of these disruptions are contextual (i.e. macro-environmental) and are, therefore, uncontrollable: *‘the main problems in PRROs are related to insecurity. Everything can move very quickly so that it is sometimes difficult to plan operations in the long term’* (#1). While remaining uncontrollable, some contextual disruptions are, nevertheless, foreseeable. For example, *‘in Burkina Faso, there is a problem of infrastructure during the rainy season, we know that. From November to June, during the dry season, there is no access problem. But in July, the rainy season starts and makes roads impassable. So interruptions are mainly due to weather problems and to the lack of infrastructure’* (#2).

Other constraints and disruptions are supply chain-related, i.e. internal to the organisation and/or the supply network. Examples include funding, supply and internal processes: *‘in Senegal, the problems to manage were mainly the lack of funding, namely funding that is delayed or does not come at all. We also had problems related to supply such as quantity issues. For example, a supplier promises to deliver 5,000 tonnes but only delivers 3,000. There are also problems related to the UN. For example, we are not allowed to make any advance payments to suppliers, be they the suppliers of food or the suppliers of transport services’* (#4).

To summarise the above interview data, it can be said that a variety of disruptions and constraints are encountered in protracted operations. These relate to issues internal to the organisation itself (e.g. the inability of WFP’s logisticians to make advance payments), problems internal to the supply network (e.g. the inability of suppliers to fulfil their commitments as well as funding delays), and contextual factors (e.g. weather problems, lack of infrastructure, and/or security issues). Due to these multiple risks and uncertainties, the fifth interviewee concludes that the environment of protracted operations is not much different from that of emergencies: *‘many protracted operations are like emergency operations’* (#5).

5.1.2. Impact on logistics operations

The interview data indicate that the above disruptive factors frequently result in access restrictions such as in Burkina Faso where *'sometimes, roads are closed in the north due to security problems'* (#2). The aforementioned constraints and disruptions along the supply chain can also cause delays and wastage: *'in Burkina Faso, allow for two months between the time the food is bought and the time it is delivered. This is the problem of all landlocked countries. It is possible to deal with that with buffer stocks in the ports. But the goods are perishable and, sometimes, the food supplies delivered expire only one or two months after the delivery date. If the food has been bought to cover four months of distribution, it is necessary to speed up the distribution operations and this poses big problems'* (#2). One further consequence of disruptions is the need to revise budgets: *'I cannot remember one PRRO for which we did not have to submit a request for budget revision. This is often to adapt to changes that can destabilise a project and also, sometimes, to update and take into consideration the latest vulnerability analyses or any other factor'* (#5).

5.1.3. Methods used to overcome disruptions

The above-mentioned negative impacts on logistics and supply chain operations are dealt with *'by adjusting field operations on an ongoing basis'* (#1). According to the fifth interviewee, *'in most PRROs in which I have been involved, there were obstacles, some circumstances, political or natural, that resulted in the need to adjust the operation along the way. We may have to open new corridors and use other access roads. Really, this is part of WFP's operational routine'* (#5). Adapting operations may also require field staff to find creative solutions. For example, *'in Burkina Faso, when there is enough funding, it is possible to preposition supplies before the rainy season. When there is not enough funding, we have to find alternative solutions such as using pirogues, camels, or donkeys'* (#2).

When solutions cannot be found in the field, WFP's logisticians can request support from other parts of the organisation that are, typically, located in the region: *'the first line of support is the regional bureau. They support the field on a number of issues, including in the case of disruptions'* (#3). The support provided is both administrative and technical, and regional bureaux play an active role in planning and implementing field operations. For example, *'they provide assistance when country offices have issues related to excesses of goods, or losses of goods, or damaged goods. They can also help with supplier agreements, with the interpretation or implementation of WFP's policies and procedures, with information sharing, the coordination of operations, or when country offices need logistics staff, etc.'* (#5). The second interviewee confirms that, *'in PRROs, we work mostly with the regional logistics officer who is the person who helps us manage our operations. We also have contacts with the country director. But there are not many contacts with the headquarters'* (#2). According to the first interviewee, *'the relationships with Rome are rare in PRROs. This is different in emergency operations where the direct contacts with the headquarters are very common'* (#1).

Whilst the contacts between headquarters divisions and field logisticians do not seem to occur frequently in protracted operations, the support of WFP's headquarters and the

organisational arrangements they implement are essential in order to support agility at the operational level. This concerns, for example, the programming aspects of an operation. *‘In countries like Afghanistan or Congo, well countries where we work in difficult situations, contingencies such as a new influx of refugees or the occurrence of natural disasters have been integrated into the design of the project. It’s already there, risk is recognised from the beginning, hence the ability to be flexible’* (#5). Organisational arrangements also include the development of tools, such as advance financing mechanisms in order to enhance field responsiveness and flexibility. As explained by the fourth interviewee, *‘one of the biggest problems in PRROs is the lack of funding. Nothing can be done without funding. A number of tools have been implemented to deal with this. For example, Forward Purchase Financing is a tool that provides agility to operations. It enables us to anticipate food purchases and consignments’* (#4).

Forward Purchase Financing is a financial instrument established by WFP in order to reduce response times as well as supply lead times and, therefore, improve the timeliness of food deliveries (WFP, 2012). Other financial tools include *‘the Working Capital Financing facility that works as an internal loan granted on the basis of anticipated contributions, for example, funding promised by Canada’* (#2). Delegation of authority is also mentioned as an organisational factor enhancing agile operations: *‘in PRROs, decision-making is decentralised at the country level and this supports agility. For example, if a village is burning, it is possible to use part of the money that was allocated to road repairs’* (#4).

Overall, the interview data provide clear indications that the logistics and supply chain environment of protracted operations is not free of disruptions, and that humanitarian organisations must take steps to overcome/mitigate the various contingencies in such operations. As will be further discussed in Section 6, the interview data also provide evidence that achieving agility requires that a number of organisational mechanisms are in place. This includes, for example, internal cooperation between the programme and the logistics functions, financial innovation, as well as the decentralisation of authority. The above results are confirmed and/or completed by the survey findings presented in the next section.

5.2. Survey results

The survey results are presented in the form of descriptive statistics that are typically used to describe, summarise and compare the basic characteristics of a data set (Saunders *et al.*, 2009). Descriptive statistics are in line with the descriptive approach selected for this research and presented in Section 4. Thus, we move from the narrative data analysis conducted in the previous section to numeric variables providing quantitative insight into the studied phenomenon, namely the logistics environment of humanitarian protracted operations. As is frequently the case with descriptive statistics, tables and charts are used in the remainder of this section to present the quantitative information. In particular, frequency counts are reported, i.e. the number of times a particular response option has been selected by respondents (Sue and Ritter, 2007).

The responses presented in Table 5 show that the survey participants perceive the supply chain environment of protracted operations as somewhat predictable. In other words, supply, demand and process risks and uncertainties are limited (but not non-existent). Thus, 65% of the respondents agree or strongly agree that the conditions are met for the humanitarian supplies to be pulled through the supply chain, i.e. that supply chains in protracted operations are demand-driven. More specifically, 52% of the respondents agree that demand patterns are stable and that there is a certain level of continuity in the supply chain environment with logistics information available in a timely and accurate manner (83% of the respondents agree or strongly agree with this statement), a well-established network of supply chain participants (74% of the respondents agree or strongly agree with this statement), stable delivery lead times, and functional order fulfilment processes (52% of the respondents agree with both statements).

To what extent do you agree or disagree with the following statements regarding PRROs? (n=23)	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree	N/A
Demand patters are stable	0	12	6	4	1	0
Delivery lead times are regular	0	12	6	4	1	0
The network of supply chain participants (suppliers, implementing partners, etc.) is well established	1	16	6	0	0	0
Timely and accurate logistics information is available (e.g. inventory levels, physical position of the goods, etc.)	4	15	2	2	0	0
Supply chains are demand-driven (i.e. supplies are pulled through the supply chain)	1	14	5	2	1	0
Order fulfilment processes are well established	0	12	8	2	1	0

Table 5: Supply chain characteristics of protracted operations

Despite this level of predictability, disruptions are encountered both in the supply chain environment and in the macro-environment. In the supply chain environment, the sources of disruption are both internal to the organisation and internal to the supply network. The results shown in Figure 2 indicate that funding is the supply chain-related constraint most frequently encountered in protracted operations (it was selected 19 times, i.e. by 83% of the respondents). The other frequently cited sources of disruptions include WFP's internal business processes and standard procedures, the existence of functional silos as well as unpredictability in demand.

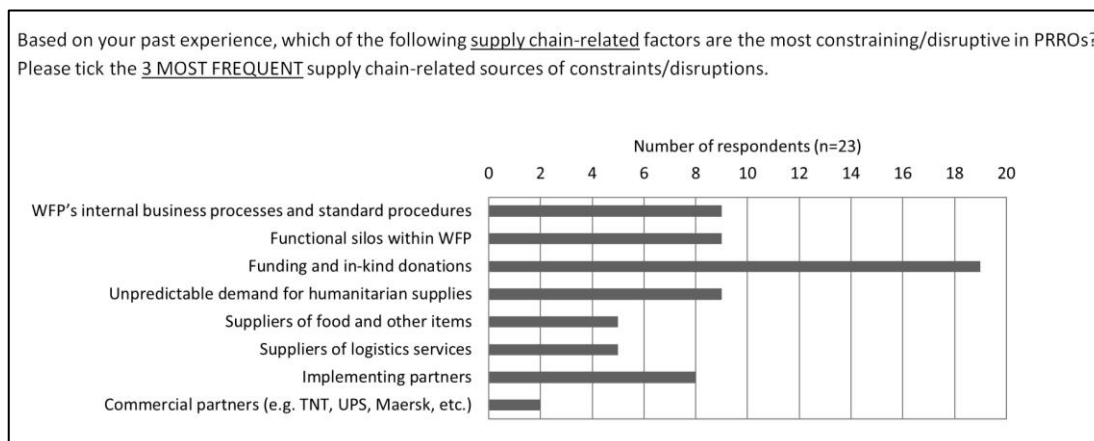


Figure 2: Supply chain-related disruptions/constraints in protracted operations

Figure 3 illustrates that the most frequent sources of uncertainty in the macro-environment of protracted operations relate to security issues, e.g. conflict and pilferage (selected by 70% of the respondents), transport and communication infrastructures (selected by 70% of the respondents), and government issues, e.g. the inefficiency of the administration and/or corrupt practices (selected by 61% of the respondents).

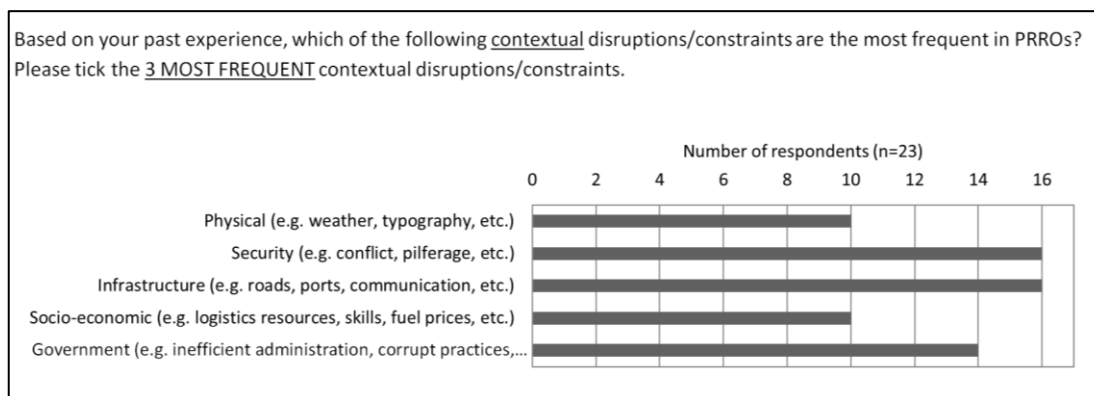


Figure 3: Contextual disruptions/constraints encountered in protracted operations

As shown in Table 6, 91% of the survey participants consider that the above-mentioned supply chain-related and contextual risks and uncertainties result in frequent or occasional bottlenecks in protracted operations. For 87%, the deliveries of humanitarian supplies are also frequently or occasionally delayed. The following frequent or occasional impacts were also mentioned by respondents: access restrictions (78%), stock-outs (74%), capacity constraints for storage and transport (65%), and cost increases beyond anticipated budget (48%).

Do <u>contextual and supply chain</u> disruptions/ constraints have the following impacts on logistics activities in PRROs? (n=23)	All the time	Frequently	Sometimes	Seldom	Never	N/A
Access restrictions	0	5	13	4	1	0
Operational bottlenecks	0	9	12	2	0	0
Capacity constraints (warehousing and/or transport)	0	2	13	8	0	0
Delayed deliveries	0	11	9	3	0	0
Stock-outs	0	6	11	5	1	0
Partial or total loss of cargo (e.g. pilferage)	0	0	5	16	2	0
Supplies not fit for purpose (e.g. damaged, deteriorated, close to or beyond expiry date)	0	0	8	12	3	0
Cost increase beyond anticipated budget	0	3	8	11	1	0
Skill shortages	0	2	7	12	1	1

Table 6: Logistics impacts of disruptions/constraints

Finally, Table 7 indicates that for 65% of the survey respondents, the above disruptions are most frequently mitigated or overcome by adapting field operations, e.g. by changing the delivery locations, the transport modes, and/or the transport routes. This indicates that disruptions and constraints are mainly dealt with at the field level. However, the support from regional bureaux, from WFP's central logistics department and from other divisions within WFP, as well as cooperation with external organisations are sometimes needed to mitigate/overcome such disruptions.

How are operational disruptions/ constraints mitigated/overcome? (n=23)	All the time	Frequently	Sometimes	Seldom	Never	N/A
By adapting field operations (e.g. changing delivery locations, transport modes, transport routes, etc.)	1	14	7	0	0	1
By deviating from the agreed internal business processes and standard procedures	0	1	6	10	4	2
By securing support from the regional bureaux	0	2	11	6	3	1
By requiring support from other teams/groups within WFP Logistics (e.g. stand-by partners, shipping, etc.)	0	4	15	2	1	1
By requesting support from other divisions within WFP (e.g. information technology, procurement, etc.)	0	2	18	2	0	1
By cooperating with other organisations (humanitarian, governmental, commercial, and/or military)	0	8	13	1	0	1

Table 7: Mitigating/Overcoming operational disruptions and constraints

6. Discussion

The literature review on supply chain risks and uncertainties as well as the above findings enable us to answer the three research questions formulated in Section 1. In relation to the first question (*Why is agility needed in humanitarian logistics operations?*), previous research shows that agility is needed in response to a variety of risks and uncertainties that go beyond the internal environment of an organisation and beyond the supply chain-related uncertainties inherent in the supply network. Agility is also needed as a result of contextual disruptions and constraints that relate to the macro-environment of each disaster situation (e.g. weather-related issues, security problems, and/or the lack of infrastructure).

With regard to the second research question (*What are the logistics characteristics of humanitarian protracted operations?*), the interview and survey data provide evidence that protracted operations are reasonably continuous operations and that the logistics environment is, to some extent, predictable. Specifically, supply chain-related risks and uncertainties (i.e. the risks/uncertainties internal to the organisation, as well as those external to the organisation but internal to the supply network) are limited since supply and demand patterns are relatively stable and delivery processes are fairly structured and functional. This operational environment allows for reasonable planning and preparation horizons and, to some degree, for a repetitive and routine approach to logistics. Protracted operations are, nevertheless, not fully stable and predictable due to a number of constraints and disruptions. These not only relate to risks and uncertainties internal to the organisation (e.g. unadapted processes), as well as to disruptions and constraints in the supply chain environment (e.g. lack of resources, changing demand, and supply issues), but first and foremost to contextual factors, i.e. externalities (e.g. security issues and/or the lack of infrastructure).

The above discussion leads us to the third research question (*Are agile practices required in humanitarian protracted operations?*). Since agility is needed in response to risks and uncertainties internal to the organisation, internal to the supply network, and related to the macro-environment of disaster situations, and since these risks and uncertainties are encountered, to a certain extent, in protracted operations, we contend that supply chain agility is needed in such operations. More specifically, the data clearly indicate that ongoing logistics adjustments are essential in order to respond swiftly to field-level contingencies and, ultimately, prevent disruptions in the flow of humanitarian supplies. To a large extent, this is because humanitarian organisations typically operate in developing countries where a degree of instability, uncertainty and unpredictability almost always prevails, and where there are multiple logistical constraints. Such changes and dynamics in the operational environment can be mitigated, or even overcome, by the use of agile principles.

Going one step further, our research shows that protracted operations require humanitarian organisations to cater simultaneously for a degree of stability and regularity in the flow of goods as well as for multiple contingencies. As such, our research empirically demonstrates that protracted operations are hybrid operations. On one hand, the supply chain environment allows for a certain level of predictability and longer-term planning and, in turn, for the achievement of a demand-driven flow of supplies. On the other hand, field complexities and dynamics exist, in particular, as a result of instabilities in the macro-environment, and this requires the development of agile capabilities. From that perspective, it is suggested that a combination of two generic supply chain strategies, i.e. operational optimisation and agile practices may be required in protracted operations. According to Christopher *et al.* (2006), a strategy of operational optimisation (i.e. a lean strategy) is suitable in an environment of predictable demand and long supply lead times. It aims to plan and optimise supply chain activities and, ultimately, achieve efficiencies in the process flows as well as cost reductions. On the other hand, agility is a quick response strategy applied when the demand environment is unpredictable and supply lead times are short. A number of authors have already argued that agile and lean principles are not mutually exclusive (Christopher, 2000; Christopher and Towill, 2001) and have suggested various techniques to achieve them simultaneously, including the Pareto curve approach, distinguishing between base and surge demand patterns, and the decoupling point/postponement strategy (Christopher and Towill, 2001). Since the purpose of this paper is not to examine the applicability of these techniques and/or to develop new approaches more appropriate to the humanitarian logistics context, additional investigations are required in this regard, as will be explained in a later section.

In addition, this research is consistent with prior humanitarian logistics research that takes a strategic approach to agility and highlights the need to build organisational capacity to support responsiveness and flexibility in the field (Tatham and Christopher, 2014; L'Hermitte *et al.*, 2015). In particular, our findings indicate that built-in agility is critical to respond swiftly and effectively to the complexities and dynamics inherent in protracted operations, and emphasise three organisational factors supporting field-level agility. First, rapid operational adjustments would not be possible without the decentralisation of authority and the empowerment of field workers, i.e. without the ability of front-line logisticians to make decisions, manage resources and adapt the planned operations as necessary. This

supports agility because decisions are taken at the point where action is needed and where the in-depth knowledge and understanding of the local conditions are located.

Second, the development of an appropriate organisational structure, i.e. the effective allocation and delegation of responsibilities to a number of entities (for example, in the framework of this paper, WFP's regionally based organisational structure), and the facilitation of the relationships and communication between the different parts of the organisation (for example, between field workers and regional bureaux) critically support agile operations. In the case of WFP, this is because regional bureaux have a better knowledge of local and regional specificities and practices, reinforce the relationships with governments and local/regional partners, contribute to speeding up decisions and actions, and bring authority and decisions closer to field operations. That said, communication between the entities of WFP's three-tier structure (that includes headquarters, regional bureaux and the field) need to be effective, streamlined and transparent in order to avoid any overlaps and/or conflict in the guidance and requests (WFP, 2009b) and, ultimately, to create agility. The data show that internal communication and coordination are also essential between the programme function (in charge of developing a suitable response strategy) and the logistics function (that organises the flows of humanitarian goods). To achieve an agile project design and enable field workers to better manage contingencies, functional silos need to be broken down, i.e. both functions need to have a clear understanding of each other's roles and constraints and work together rather than in parallel. Specifically, agility needs to be integrated into the response strategy and plans based on the logisticians' needs for flexibility.

Finally, innovation is also recognised as an essential organisational factor supporting agility. In particular, this research highlights the role played by innovative financial instruments in the ability of field logisticians to overcome funding constraints. These mechanisms are all the more important as the research data outline funding shortages as one major issue in protracted operations. This is consistent with WFP's report on the evaluation of the PRRO category (WFP, 2004a) which indicates that donors tend to prioritise funding for the emergency phase of a humanitarian crisis over protracted operations. Thus, innovative financial instruments enhance supply chain agility by improving advance planning, by supporting the ability to better anticipate (and, therefore mitigate) disruptions, by reducing delays in purchases and deliveries due to funding issues, and by improving the timeliness of humanitarian deliveries.

To summarise the above discussions, and following Yin's (2003) recommendation regarding the output of case study research, four propositions emerge from the WFP case study. These propositions are:

- P1.* Protracted operations are hybrid operations characterised simultaneously by a degree of stability, predictability and regularity in the flow of goods and by field complexities and dynamics.
- P2.* The level of stability, predictability and regularity existing in protracted operations enables humanitarian organisations to focus on operational optimisation and cost control.

- P3. Humanitarian organisations need to retain a degree of agility in protracted operations in order to deal with the inefficiencies and complexities internal to the organisation and internal to the supply network, and with the volatility and uncertainty in the contextual environment.
- P4. Organisational factors are critical to build and maintain agility and, ultimately, to respond quickly and effectively to the short-term complexities and dynamics inherent in protracted operations.

These propositions are testable and open new avenues for academic research, a number of which will be considered in Section 8.

7. Contributions

The contributions of this paper are twofold. First, this study is the first empirical research that focuses exclusively on the logistics features of protracted operations and that contributes a more concrete and complete understanding of these operations. In doing so, this paper adds to an emerging but growing volume of humanitarian logistics literature on the importance of differentiating between operational environments (Howden, 2009; Hughes, 2009; Holguín-Veras *et al.*, 2012; Venkatesh *et al.*, 2013). In particular, this paper emphasises that logistics operations do not stop with the urgent delivery of relief supplies and the rapid deployment of teams of experts in the aftermath of a disaster. Although this may seem obvious, the current humanitarian logistics literature does not appropriately reflect the importance of logistics beyond the emergency phase of a disaster. Thus, this research joins the few previous studies (e.g. Kovács and Spens, 2011a; Kunz and Reiner, 2012) that highlight this deficiency, and contributes to addressing it by exploring the logistics environment of WFP's protracted operations.

Second, this research establishes that humanitarian protracted environments are not fully stable and that unpredictability and disruptions exist. As a consequence, the paper demonstrates that operational optimisation and efficiency strategies are not fully appropriate and need to be completed by the development of agile practices in order to support the continuity of humanitarian deliveries in protracted operations. Mainly, this is because a disaster response, be it in the emergency or in the recovery phase of a disaster, is entrenched in its external, i.e. contextual environment. This environment has a significant impact on logistics operations and creates unique logistics and supply chain conditions (Whybark *et al.*, 2010). Thus, this paper highlights the fact that, in the humanitarian logistics discipline, the concept of agility cannot be studied solely by focusing on supply chain-related risks and uncertainties, i.e. in relation to demand, supply and processes, as has primarily been done in the business literature and, by extension, in this related to humanitarian logistics (L'Hermitte *et al.*, 2015). In addition to these challenges, contextual factors need to be considered and integrated into the analysis. As a consequence, our findings establish that the selection of an appropriate supply chain strategy in the humanitarian context goes beyond applying agile principles in the emergency response and lean principles in the recovery stage of a disaster, as this has been claimed in the current humanitarian logistics literature. In other words, this study builds a case for looking at humanitarian protracted operations through a different lens from that previously found in the literature.

Going one step further, this research emphasises the importance of considering the specificities of the humanitarian environment when applying business strategies to humanitarian operations. As argued by Taylor and Pettit (2009), business principles and strategies can usefully and successfully be transferred to the humanitarian logistics and supply chain context provided the differences between both environments are recognised and taken into account.

8. Limitations and further research

This study takes a descriptive research approach to reflect on, and better delineate, the concept of humanitarian protracted operations. Further investigations should be undertaken in order to confirm/refine our results and to complete our reflection on the logistics environment of humanitarian protracted operations. First, since this research is focused on a single case study (WFP), further research involving other humanitarian actors should be conducted. In particular, it should be determined if other organisations face the same sources of logistics and supply chain disruptions in protracted operations and how they respond.

Second, this research's relatively small number of interviewees and survey respondents does not enable our results to be considered representative of the population, i.e. representative of all WFP logisticians involved in protracted operations. In other words, the statistics presented in Section 5.2 cannot be extended beyond the limited scope of this research. Thus, in addition to broadening investigations beyond the scope of a single organisation, increasing the number of interviews and survey participants is a necessary condition to make research on protracted operations generalisable.

Third, it appears that there is a level of ambiguity in our research regarding the issue of costs and budget. Whilst Table 5 indicates that cost increases beyond the anticipated budget do not occur frequently, the interview data suggest that budget revisions are commonly required. Additional investigations are needed to clarify this issue.

Fourth, since the nature of this research is descriptive, its purpose is to shed light on the operational environment of protracted operations and to demonstrate that such operations are not conducted in a fully stable and predictable setting. Although a number of organisational mechanisms supporting agility are identified, this paper does not go as far as to provide a plan of action for humanitarian organisations seeking to increase the effectiveness and efficiency of their longer-term operations. As a consequence, more research is required in order to extend the knowledge of protracted operations, and to develop adapted analytical models as well as practical and actionable recommendations for practitioners. In particular, since protracted operations have been characterised as hybrid in Section 6, the path forward to optimise these operations and develop efficiencies as well as, simultaneously, retain a certain level of agility in order to cope with turbulence should be further investigated. To this end, researchers could further investigate the role played by the agility-enhancing elements mentioned in Section 3.1. These elements include, among other things, information management and exchange, IT integration, inter-organisational coordination, the cluster approach, and collaboration with suppliers. In doing so, research on protracted operations

will inform practice, move from a descriptive to a prescriptive approach and, ultimately, develop a theoretical framework for humanitarian protracted operations.

Finally, as mentioned in Section 3.1, the present study focuses on the concept of agility, i.e. the ability of humanitarian organisations to identify short-term turbulent events along the supply chain and to move quickly in order to avoid, as much as possible, any disruptions in the flow of goods. Further research could consider the related concepts of supply chain adaptability, alignment and resilience, as well as the extent to which these properties are also needed in the context of protracted operations.

9. Conclusion

Notwithstanding the limitations discussed above, this paper provides a better understanding of the concept of humanitarian protracted operations from a logistics and supply chain perspective. It demonstrates that the environment of such operations is not fully stable and predictable due to the existence of a number of supply chain-related and, above all, contextual uncertainties and complexities. Thus, this research demonstrates that supply chain agility is an essential operational requirement in humanitarian protracted operations. It also highlights the importance of differentiating between operational environments in the humanitarian context, and of identifying the distinctive features of each of these environments in order to determine the type of supply chain practices and strategies that are best appropriate to them.

REFERENCES

- Abidi, H., de Leeuw, S. and Klumpp, M. (2013), "Measuring success in humanitarian supply chains", *International Journal of Business and Management Innovation*, Vol. 2, No. 8, pp. 31-9.
- Ackoff, R.L. (1971), "Towards a system of systems concepts", *Management Science*, Vol. 17, No. 11, pp. 661-71.
- Ackoff, R.L. (1973), "Science in the systems age: beyond IE, OR, and MS", *Operations Research*, Vol. 21, No. 3, pp. 661-71.
- Ackoff, R.L. (1974), "The systems revolution", *Long Range Planning*, Vol. 7, No. 6, pp. 2-20.
- Ackoff, R.L., Addison, H.J. and Carey, A. (2010), *Systems thinking for curious managers*, Triarchy Press, Axminster.
- ACMC (2012), "Same space - Different mandates", Australian Civil-Military Centre, available at: <https://www.acmc.gov.au/publications/same-space-different-mandates/> (accessed 9 November 2015).
- ADB (2004), "Disaster and emergency assistance policy", Asian Development Bank, available at: <http://www.adb.org/documents/disaster-and-emergency-assistance-policy> (accessed 9 November 2015).
- Alexander, D. (2005), "An interpretation of disaster in terms of changes in culture, society and international relations", in Perry, R.W. and Quarantelli, E.L. (Eds.), *What is a disaster? New answers to old questions*, International Research Committee on Disasters, University of Delaware, Newark, DE, pp. 25-38.
- Ali, H. and Birley, S. (1999), "Integrating deductive and inductive approaches in a study of new ventures and customer perceived risk", *Qualitative Market Research*, Vol. 2, No. 2, pp. 103-10.
- Allen, A.M., Kovács, G., Masini, A., Vaillancourt, A. and Van Wassenhove, L. (2013), "Exploring the link between the humanitarian logistician and training needs", *Journal of Humanitarian Logistics and Supply Chain Management*, Vol. 3, No. 2, pp. 129-48.
- Allen, P., Bennett, K. and Heritage, B. (2014), *SPSS Statistics version 22: a practical guide*, Cengage Learning Australia, Melbourne.
- Altay, N. (2008), "Issues in disaster relief logistics", in Gad-El-Hak, M. (Ed.), *Large-scale disasters: prediction, control and mitigation*, Cambridge University Press, New York, pp. 120-46.
- Altay, N. and Green III, W.G. (2006), "OR/MS research in disaster operations management", *European Journal of Operational Research*, Vol. 175, No. 1, pp. 475-93.
- Altay, N. and Labonte, M. (2014), "Challenges in humanitarian information management and exchange: evidence from Haiti", *Disasters*, Vol. 38, No. s1, pp. S50-S72.
- Altay, N. and Pal, R. (2014), "Information diffusion among agents: implications for humanitarian operations", *Production and Operations Management*, Vol. 23, No. 6, pp. 1015-27.
- Altay, N., Prasad, S. and Sounderpandian, J. (2009), "Strategic planning for disaster relief logistics: lessons from supply chain management", *International Journal of Services Sciences*, Vol. 2, No. 2, pp. 142-61.
- Appelo, J. (2011), *Management 3.0: leading agile developers, developing agile leaders*, Pearson Education, Upper Saddle River, NJ.
- Apte, A. (2010), *Humanitarian logistics: a new field of research and action*, Now Publishers, Hanover, MA.
- Armstrong, J. (2014), "The future of humanitarian security in fragile contexts", European Interagency Security Forum, available at: <https://www.eisf.eu/wp-content/uploads/2014/09/1129-Armstrong-2014-The-Future-of-Humanitarian-Security-in-Fragile-Contexts.pdf> (accessed 9 November 2015).
- Bailey, K.D. (1989), "Taxonomy and disaster: prospects and problems", *International Journal of Mass Emergencies and Disasters*, Vol. 7, No. 3, pp. 419-31.
- Bailey, K.D. (1994), *Typologies and taxonomies: an introduction to classification techniques*, Sage Publications, Thousand Oaks, CA.
- Bailey, K.D. (2000), "Typologies", in Borgatta, E.F. and Montgomery, R.J.V. (Eds.), *Encyclopedia of sociology*, Macmillan Reference, New York, NY, pp. 3180-9.
- Balcik, B. and Beamon, B.M. (2008), "Facility location in humanitarian relief", *International Journal of Logistics Research and Applications*, Vol. 11, No. 2, pp. 101-21.

References

- Balcik, B., Beamon, B.M., Krejci, C.C., Muramatsu, K.M. and Ramirez, M. (2010), "Coordination in humanitarian relief chains: practices, challenges and opportunities", *International Journal of Production Economics*, Vol. 126, No. 1, pp. 22-34.
- Ballou, R.H. (2004), *Business logistics/supply chain management*, Pearson Education, Upper Saddle River, NJ.
- Bammel, J.L. and Rodman, W.K. (2006), "Humanitarian logistics: a guide to operational and tactical logistics in humanitarian emergencies", *Air Force Journal of Logistics*, Vol. 30/31, No. 4/1, pp. 1-42.
- Barnett, M. and Walker, P. (2015), "Regime change for humanitarian aid: how to make relief more accountable", *Foreign Affairs*, Council of Foreign Relations, July/August, available at: <https://www.foreignaffairs.com/articles/2015-06-16/regime-change-humanitarian-aid> (accessed 9 November 2015).
- Barney, J. (1991), "Firm resources and sustained competitive advantage", *Journal of Management*, Vol. 17, No. 1, pp. 99-120.
- Beamon, B.M. and Balcik, B. (2008), "Performance measurement in humanitarian relief chains", *The International Journal of Public Sector Management*, Vol. 21, No. 1, pp. 4-25.
- Becker, H. (1940), "Constructive typology in the social sciences", *American Sociological Review*, Vol. 5, No. 1, pp. 40-55.
- Benini, A., Conley, C., Dittmore, B. and Waksman, Z. (2009), "Survivor needs or logistical convenience? Factors shaping decisions to deliver relief to earthquake-affected communities, Pakistan 2005–06", *Disasters*, Vol. 33, No. 1, pp. 110-31.
- Bennett, C. (2015), "The development agency of the future - Fit for protracted crises?", Overseas Development Institute, available at: <http://www.odi.org/sites/odi.org.uk/files/odi-assets/publications-opinion-files/9612.pdf> (accessed 9 November 2015).
- Bennett, D.A. (2001), "How can I deal with missing data in my study?", *Australian and New Zealand Journal of Public Health*, Vol. 25, No. 5, pp. 464-9.
- Bentler, P.M. and Chou, C.-P. (1987), "Practical issues in structural modeling", *Sociological Methods Research*, Vol. 16, No. 8, pp. 78-117.
- Beresford, A. and Pettit, S. (2012), "Humanitarian aid logistics: the Wenchuan and Haiti earthquakes compared", in Kovács, G. and Spens, K. (Eds.), *Relief supply chain management for disasters*, IGI Global, Hershey, PA, pp. 45-67.
- Berg, B.L. (2007), *Qualitative research methods for the social sciences*, Pearson Education, Boston, MA.
- Berren, M.R., Beigel, A. and Ghertner, S. (1980), "A typology for the classification of disasters", *Community Mental Health Journal*, Vol. 16, No. 2, pp. 103-11.
- Besiou, M., Stapleton, O. and Van Wassenhove, L.N. (2011), "System dynamics for humanitarian operations", *Journal of Humanitarian Logistics and Supply Chain Management*, Vol. 1, No. 1, pp. 78-103.
- Blansjaar, M. and Stephens, F. (2014), "Information technology in humanitarian supply chains", in Tatham, P.H. and Christopher, M.G. (Eds.), *Humanitarian Logistics*, Kogan Page, London, pp. 57-73.
- Blansjaar, M. and Van der Merwe, C. (2011), "The importance of information technology in humanitarian supply chains: opportunities and challenges in the Helios project", in Christopher, M.G. and Tatham, P.H. (Eds.), *Humanitarian logistics*, Kogan Page, London, pp. 47-63.
- Blecken, A. (2010a), *Humanitarian logistics: modelling supply chain processes of humanitarian organisations*, Haupt, Berne.
- Blecken, A. (2010b), "Logistics in the context of humanitarian operations", in Dangelmaier, W., Blecken, A., Delius, R. and Klöpfer, S. (Eds.), *8th International Heinz Nixdorf Symposium, Paderborn, Germany, 21-22 April*, pp. 85-93.
- Blecken, A. (2010c), "Supply chain process modelling for humanitarian organizations", *International Journal of Physical Distribution & Logistics Management*, Vol. 40, No. 8/9, pp. 675-92.
- Blecken, A., Hellingrath, B., Dangelmaier, W. and Schulz, S.F. (2009), "A humanitarian supply chain process reference model", *International Journal of Services Technology and Management*, Vol. 12, No. 4, pp. 391-413.
- Boin, A. (2005), "From crisis to disaster: towards an integrative perspective", in Perry, R.W. and Quarantelli, E.L. (Eds.), *What is a disaster? New answers to old questions*, International Research Committee on Disasters, University of Delaware, Newark, DE, pp. 152-72.

- Bollen, K.A. (1989), *Structural equations with latent variables*, John Wiley and Sons, New York, NY.
- Bontis, N., Crossan, M.M. and Hulland, J. (2002), "Managing an organizational learning system by aligning stocks and flows", *Journal of Management Studies*, Vol. 39, No. 4, pp. 437-69.
- Born, C.T. and Calfee, R.P. (2009), "Disaster management", in Browner, B.D., Jupiter, J.B., Levine, A.M., Trafton, M.D. and Krettek, C. (Eds.), *Skeletal trauma: basic science, management, and reconstruction*, W. B. Saunders Company, Philadelphia, PA, pp. 219-35.
- Bosona, T. (2013), "Logistics risks in the food supply chains", Forum for Agricultural Risk Management in Development, available at: <https://www.agriskmanagementforum.org/content/logistics-risks-food-supply-chains> (accessed 9 November 2015).
- Boulding, K.E. (1956), "General systems theory - The skeleton of science", *Management Science*, Vol. 2, No. 3, pp. 197-208.
- Bowles, M. (2004), *Relearning to e-learn: strategies for electronic learning and knowledge*, Melbourne University Press, Carlton.
- Boxell, J. (2013), "Bolloré logistics arm to 'unlock Africa'", *Financial Times*, 14 March, available at: <http://www.ft.com/intl/cms/s/0/e26ac842-8b1a-11e2-8fcf-00144feabdc0.html#axzz2O1SqmCpv> (accessed 9 November 2015).
- Braunscheidel, M.J. and Suresh, N.C. (2009), "The organizational antecedents of a firm's supply chain agility for risk mitigation and response", *Journal of Operations Management*, Vol. 27, No. 2, pp. 119-40.
- Browne, M.W. and Cudeck, R. (1992), "Alternative ways of assessing model fit", *Sociological Methods Research*, Vol. 21, No. 2, pp. 230-58.
- Buatsi, S.N., Oduro, F.T., Annan, J., Turkson, E. and Kwesi-Bour, J. (2007), "The role of logistics in humanitarian aid in disaster relief and continuous aid operations, The Case of Care International Ghana", in Tatham, P.H. (Ed.), *First International Humanitarian Logistics Symposium*, Farington.
- Buddas, H.M. (2014), "A bottleneck analysis in the IFRC supply chain", *Journal of Humanitarian Logistics and Supply Chain Management*, Vol. 4, No. 2, pp. 222-44.
- Byrne, B.M. (2010), *Structural equation modeling with AMOS*, Taylor & Francis Group, New York, NY.
- Carpenter, S. and Bennett, C. (2015), "Managing crises together: towards coherence and complementarity in recurrent and protracted crises", Overseas Development Institute, available at: <http://www.alnap.org/resource/21021.aspx> (accessed 9 November 2015).
- Chandra, C. and Grabis, J. (2007), *Supply chain configuration: concepts, solutions and applications*, Springer, New York, NY.
- Charles, A., Luras, M. and Van Wassenhove, L. (2010), "A model to define and assess the agility of supply chains: building on humanitarian experience", *International Journal of Physical Distribution & Logistics Management*, Vol. 40, No. 8/9, pp. 722-41.
- Chiang, C.-Y., Kocabasoglu-Hillmer, C. and Suresh, N. (2012), "An empirical investigation of the impact of strategic sourcing and flexibility on firm's supply chain agility", *International Journal of Operations & Production Management*, Vol. 32, No. 1, pp. 49-78.
- Chopra, S. and Sodhi, M.S. (2004), "Managing risk to avoid supply-chain breakdown", *MIT Sloan Management Review*, Vol. 46, No. 1, pp. 53-61.
- Christensen, C.M. (2006), "The ongoing process of building a theory of disruption", *Journal of Product Innovation Management*, Vol. 23, No. 1, pp. 39-55.
- Christensen, C.M. and Carlile, P.R. (2009), "Course research: using the case method to build and teach management theory", *Academy of Management Learning & Education*, Vol. 8, No. 2, pp. 240-51.
- Christopher, M.G. (2000), "The agile supply chain: competing in volatile markets", *Industrial Marketing Management*, Vol. 29, No. 1, pp. 37-44.
- Christopher, M.G. (2005), *Logistics and supply chain management: creating value-adding networks*, FT Prentice Hall, Harlow.
- Christopher, M.G. (2011), *Logistics and supply chain management*, Pearson Education, Harlow.
- Christopher, M.G. and Holweg, M. (2011), "'Supply Chain 2.0': managing supply chains in the era of turbulence", *International Journal of Physical Distribution & Logistics Management*, Vol. 41, No. 1, pp. 63-82.

References

- Christopher, M.G. and Lee, H.L. (2004), "Mitigating supply chain risk through improved confidence", *International Journal of Physical Distribution & Logistics Management*, Vol. 34, No. 5, pp. 388-96.
- Christopher, M.G. and Peck, H. (2004), "Building the resilient supply chain", *The International Journal of Logistics Management*, Vol. 15, No. 2, pp. 1-14.
- Christopher, M.G., Peck, H. and Towill, D. (2006), "A taxonomy for selecting global supply chain strategies", *International Journal of Logistics Management*, Vol. 17, No. 2, pp. 277-87.
- Christopher, M.G. and Towill, D.R. (2001), "An integrated model for the design of agile supply chains", *International Journal of Physical Distribution & Logistics Management*, Vol. 31, No. 4, pp. 235-46.
- Churchill, B. (2013), "Content analysis", in Walter, M. (Ed.), *Social research methods*, Oxford University Press, Oxford, pp. 254-69.
- Churchill, G.A. (1979), "A paradigm for developing better measures of marketing constructs", *Journal of Marketing Research*, Vol. 16, No. 1, pp. 64-73.
- Cobb, C.G. (2011), *Making sense of agile project management: balancing control and agility*, Wiley, Hoboken, NJ.
- Cockburn, A. (2007), *Agile software development: the cooperative game*, Pearson Education, Upper Saddle River, NJ.
- Collier, D., LaPorte, J. and Seawright, J. (2012), "Putting typologies to work: concept formation, measurement, and analytic rigor", *Political Research Quarterly*, Vol. 65, No. 1, pp. 217-32.
- Conway, J.M. and Lance, C.E. (2010), "What reviewers should expect from authors regarding common method bias in organizational research", *Journal of Business and Psychology*, Vol. 25, No. 3, pp. 325-34.
- Cozzolino, A., Rossi, S. and Conforti, A. (2012), "Agile and lean principles in the humanitarian supply chain", *Journal of Humanitarian Logistics and Supply Chain Management*, Vol. 2, No. 1, pp. 16-33.
- Cranfield University (2003), "Understanding supply chain risk", Cranfield School of Management - Centre for Logistics and Supply Chain Management, available at: <http://www.som.cranfield.ac.uk/som/dinamic-content/research/lscm/downloads/60599WOR.PDF> (accessed 9 November 2015).
- CRED (2009), "Criteria and definition", Centre for Research on the Epidemiology of Disasters, available at: <http://www.emdat.be/criteria-and-definition> (accessed 9 November 2015).
- CRS (2012), "Horn of Africa: the humanitarian crisis and international response", Congressional Research Service, available at: <http://www.fas.org/sgp/crs/row/R42046.pdf> (accessed 9 November 2015).
- CSCMP (2015), "Supply chain management", Council of Supply Chain Management Professionals, available at: <http://cscmp.org/about-us/supply-chain-management-definitions> (accessed 9 November 2015).
- Dadzie, K.Q. (1998), "Transfer of logistics knowledge to Third World countries", *International Journal of Physical Distribution & Logistics Management*, Vol. 28, No. 4, pp. 272-83.
- Daellenbach, H.G. and McNickle, D.C. (2005), *Management science: decision making through systems thinking*, Palgrave Macmillan, New York, NY.
- Darcy, J., Bonard, P. and Shukria, D. (2012), "IASC real-time evaluation of the humanitarian response to the Horn of Africa drought crisis - Somalia 2011-2012", Inter-Agency Standing Committee, available at: <https://docs.unocha.org/sites/dms/Documents/IASC-RTE%20Somalia%202012.pdf> (accessed 9 November 2015).
- Davidson, A.L. (2006), "Key performance indicators in humanitarian logistics", Massachusetts Institute of Technology, available at: <http://dspace.mit.edu/handle/1721.1/35540> (accessed 9 November 2015).
- Day, J.M., Melnyk, S.A., Larson, P.D., Davis, E.W. and Whybark, D.C. (2012), "Humanitarian and disaster relief supply chains: a matter of life and death", *Journal of Supply Chain Management*, Vol. 48, No. 2, pp. 21-36.
- De Smet, H., Lagadec, P. and Leysen, J. (2012), "Disasters out of the box: a new ballgame?", *Journal of Contingencies and Crisis Management*, Vol. 20, No. 3, pp. 138-48.
- Dekker, A.H. (2006), "Measuring the agility of networked military forces", *Journal of Battlefield Technology*, Vol. 9, No. 1, pp. 19-24.
- DeLoach, J.W. (2000), *Enterprise-wide risk management: strategies for linking risk and opportunity*, FT Prentice Hall, London.

- Deloitte (2012), "Supply chain resilience: a risk intelligent approach to managing global supply chains", available at: <http://deloitteblog.co.za/wp-content/uploads/2013/07/Supply-chain-resilience-A-risk-intelligent-approach-to-managing-global-supply-chains.pdf> (accessed 9 November 2015).
- Development Initiatives (2015), "Global humanitarian assistance report 2015", Global Humanitarian Assistance, available at: <http://www.globalhumanitarianassistance.org/report/gha-report-2015> (accessed 9 November 2015).
- DeVor, R., Graves, R. and Mills, J.J. (1997), "Agile manufacturing research: accomplishments and opportunities", *IIE Transactions*, Vol. 29, No. 10, pp. 813-23.
- Dijkzeul, D., Hilhorst, D. and Walker, P. (2013), "Introduction: evidence-based action in humanitarian crises", *Disasters*, Vol. 37, pp. S1-S19.
- Dillman, D.A., Smyth, J.D. and Christian, L.M. (2009), *Internet, mail, and mixed-mode surveys: the tailored design method*, John Wiley & Sons, Hoboken, NJ.
- Doty, D.H. and Glick, W.H. (1994), "Typologies as a unique form of theory building: toward improved understanding and modeling", *Academy of Management Review*, Vol. 19, No. 2, pp. 230-51.
- Dove, R. (1996), "Agile supply-chain management", *Automotive Production*, Vol. 108, No. 4, pp. 16-7.
- Doz, Y. and Kosonen, M. (2008a), "The dynamics of strategic agility: Nokia's rollercoaster experience", *California Management Review*, Vol. 50, No. 3, pp. 95-118.
- Doz, Y. and Kosonen, M. (2008b), *Fast strategy*, Pearson Education, Harlow.
- Drouhin, E. (2013), "Supply chain guide gets nutritious food where it needs to go", World Food Programme, available at: <https://www.wfp.org/aid-professionals/blog/blog/supply-chain-guide-nutritious-food> (accessed 9 November 2015).
- Drucker, P.F. (1994), "The theory of the business", *Harvard Business Review*, September-October, available at: <http://hbr.org/1994/09/the-theory-of-the-business/ar/1> (accessed 9 November 2015).
- Dua, J. and Menkhaus, K. (2012), "The context of contemporary piracy - The case of Somalia", *Journal of International Criminal Justice*, Vol. 10, No. 4, pp. 1478-387.
- Dubey, R. and Gunasekaran, A. (2016), "The sustainable humanitarian supply chain design: agility, adaptability and alignment", *International Journal of Logistics: Research and Applications*, Vol. 19, No. 1, pp. 62-82.
- Dubey, R., Singh, T. and Gupta, O.K. (2015), "Impact of agility, adaptability and alignment on humanitarian logistics performance: mediating effect of leadership", *Global Business Review*, Vol. 16, No. 5, pp. 812-31.
- Dynes, R.R. (1994), "Community emergency planning: false assumptions and inappropriate analogies", *International Journal of Mass Emergencies and Disasters*, Vol. 12, No. 2, pp. 141-58.
- Eisenhardt, K.M. (1989), "Building theories from case study research", *The Academy of Management Review*, Vol. 14, No. 4, pp. 532-50.
- Eisenhardt, K.M. and Martin, J.A. (2000), "Dynamic capabilities: what are they?", *Strategic Management Journal*, Vol. 21, No. 10/11, pp. 1105-21.
- Ertem, M.A., Buyurgan, N. and Rossetti, M.D. (2010), "Multiple-buyer procurement auctions framework for humanitarian supply chain management", *International Journal of Physical Distribution & Logistics Management*, Vol. 40, No. 3, pp. 202-27.
- Eshghi, K. and Larson, R.C. (2008), "Disasters: lessons from the past 105 years", *Disaster Prevention and Management*, Vol. 17, No. 1, pp. 62-82.
- Everywhere, Jahre, M. and Navangul, K.A. (2011), "Predicting the unpredictable – Demand forecasting in international humanitarian response", *NOFOMA 2011 Conference, Harstad University College, Norway, June*.
- Fawcett, A.M. and Fawcett, S.E. (2013), "Benchmarking the state of humanitarian aid and disaster relief: a systems design perspective and research agenda", *Benchmarking: An International Journal*, Vol. 20, No. 5, pp. 661-92.
- Featherstone, A. (2014), "Missed again: making space for partnership in the Typhoon Haiyan response", Actionaid, CAFOD, Christian Aid, Oxfam, Tearfund, available at: <http://reliefweb.int/sites/reliefweb.int/files/resources/missed-again-typhoon-haiyan-september-2014.pdf> (accessed 9 November 2015).

References

- Fenton, G., Goodhand, M. and Vince, R. (2014), "What next for humanitarian logistics?", in Tatham, P.H. and Christopher, M.G. (Eds.), *Humanitarian logistics*, Kogan Page, London, pp. 215-33.
- Fink, S., Nossiter, A. and Kanter, J. (2014), "Doctors Without Borders evolves as it forms the vanguard in Ebola fight", *The New York Times*, 10 October, available at: http://www.nytimes.com/2014/10/11/world/africa/doctors-without-borders-evolves-as-it-forms-the-vanguard-in-ebola-fight.html?_r=1 (accessed 9 November 2015).
- Fisher, M.L. (1997), "What Is the right supply chain for your product?", *Harvard Business Review*, Vol. 75, No. 2, pp. 105-16.
- Flyvbjerg, B. (2006), "Five misunderstandings about case-study research", *Qualitative Inquiry*, Vol. 12, No. 2, pp. 219-45.
- Forrester, J.W. (1990), *Principles of systems*, Productivity Press, Portland, OR.
- Forrester, J.W. (2007a), "System dynamics - A personal view of the first fifty years", *System Dynamics Review*, Vol. 23, No. 2/3, pp. 345-58.
- Forrester, J.W. (2007b), "System dynamics - The next fifty years", *System Dynamics Review*, Vol. 23, No. 2/3, pp. 359-70.
- Fowler, F.J. (1988), *Survey research methods*, Sage Publications, Newbury Park, CA.
- FSNAU (2011), "Nutrition Analysis Post Gu 2011", Food Security and Nutrition Analysis Unit, available at: <http://reliefweb.int/report/somalia/fsnau-technical-series-report-no-vi-41-nutrition-analysis-post-gu-2011> (accessed 9 November 2015).
- FSNAU and FEWS NET (2012), "Famine ends, yet 31% of the population remain in crisis", Food Security and Nutrition Analysis Unit and Famine Early Warning Systems Network, available at: http://reliefweb.int/sites/reliefweb.int/files/resources/Full%20Report_532.pdf (accessed 9 November 2015).
- Fugate, B.S., Mentzer, J.T. and Stank, T.P. (2010), "Logistics performance: efficiency, effectiveness, and differentiation", *Journal of Business Logistics*, Vol. 31, No. 1, pp. 43-62.
- Garver, M.S. and Mentzer, J.T. (1999), "Logistics research methods: employing structural equation modeling to test for construct validity", *Journal of Business Logistics*, Vol. 20, No. 1, pp. 33-57.
- Garvin, D.A. (1993), "Building a learning organization", *Harvard Business Review*, July-August, pp. 78-91.
- Gatignon, A., Van Wassenhove, L.N. and Charles, A. (2010), "The Yogyakarta earthquake: humanitarian relief through IFRC's decentralized supply chain", *International Journal of Production Economics*, Vol. 126, No. 1, pp. 102-10.
- Gattorna, J. (2006), *Living supply chains*, Pearson Education, Harlow.
- Gattorna, J. (2009), "Lean and agile supply chains", in Gattorna, J. (Ed.), *Dynamic supply chain alignment*, Gower Publishing Limited, Farnham, pp. 81-4.
- Gimenez, C., Large, R. and Ventura, E. (2005), "SCM research methodologies: employing structural equation modeling", in Kotzab, H., Seuring, S., Müller, M. and Reiner, G. (Eds.), *Research methodologies in supply chain management*, Physica-Verlag, Heidelberg, pp. 155-70.
- Giroux, H., Beaulieu, M. and Cooren, F. (2009), "Gérer les chaînes logistiques humanitaires : l'expérience de Médecins Sans Frontières", *Logistique & Management*, Vol. 17, No. 1, pp. 65-76.
- Giunipero, L.C. and Eltantawy, R.A. (2004), "Securing the upstream supply chain: a risk management approach", *International Journal of Physical Distribution & Logistics Management*, Vol. 34, No. 9, pp. 698-713.
- Gligor, D.M. (2013), "The concept of supply chain agility: conceptualization, antecedents, and the impact on firm performance", University of Tennessee, available at: http://trace.tennessee.edu/cgi/viewcontent.cgi?article=2881&context=utk_graddiss (accessed 9 November 2015).
- Gligor, D.M., Esmark, C.L. and Holcomb, M.C. (2015), "Performance outcomes of supply chain agility: when should you be agile?", *Journal of Operations Management*, Vol. 33-34, pp. 71-82.
- Gligor, D.M. and Holcomb, M.C. (2012a), "Antecedents and consequences of supply chain agility: establishing the link to firm performance", *Journal of Business Logistics*, Vol. 33, No. 4, pp. 295-308.
- Gligor, D.M. and Holcomb, M.C. (2012b), "Understanding the role of logistics capabilities in achieving supply chain agility: a systematic literature review", *Supply Chain Management: An International Journal*, Vol. 17, No. 4, pp. 438-53.

- Gligor, D.M. and Holcomb, M.C. (2014), "The road to supply chain agility: an RBV perspective on the role of logistics capabilities", *The International Journal of Public Sector Management*, Vol. 25, No. 1, pp. 169-79.
- Goldman, S.L. and Nagel, R.N. (1993), "Management, technology and agility: the emergence of a new era in manufacturing", *International Journal of Technology Management*, Vol. 8, No. 1/2, pp. 18-38.
- Gonçalves, P. (2008), "System dynamics modeling of humanitarian relief operations", MIT Sloan School of Management, available at: <http://dspace.mit.edu/bitstream/handle/1721.1/65430/SSRN-id1139817.pdf?sequence=1> (accessed 9 November 2015).
- Gonçalves, P. (2011), "Balancing provision of relief and recovery with capacity building in humanitarian operations", *Operations Management Research*, Vol. 4, No. 1/2, pp. 39-50.
- Grimm, P. (2010), "Pretesting a questionnaire", *Wiley International Encyclopedia of Marketing*, John Wiley & Sons, available at: <http://onlinelibrary.wiley.com/doi/10.1002/9781444316568.wiem02051/full> (accessed 9 November 2015).
- Grünewald, F. (2012), "Aid in a city at war: the case of Mogadishu, Somalia", *Disasters*, Vol. 36, pp. S105-25.
- GT Nexus (2010), "World Food Programme turns to GT Nexus for logistics visibility and supply network agility", available at: <http://www.gtnexus.com/newsroom/press-release/world-food-programme-turns-gt-nexus-logistics-visibility-and-supply-network> (accessed 9 November 2015).
- Gullo, M.J., Dawe, S., Kambouropoulos, N., Staiger, P.K. and Jackson, C.J. (2010), "Alcohol expectancies and drinking refusal self-efficacy mediate the association of impulsivity with alcohol misuse", *Alcoholism: Clinical and Experimental Research*, Vol. 34, No. 8, pp. 1386-99.
- Gunasekaran, A. (1998), "Agile manufacturing: enablers and an implementation framework", *International Journal of Production Research*, Vol. 36, No. 5, pp. 1223-47.
- Gunasekaran, A. (1999), "Agile manufacturing: a framework for research and development", *International Journal of Production Economics*, Vol. 62, No. 1/2, pp. 87-105.
- Gunasekaran, A. and Yusuf, Y.Y. (2002), "Agile manufacturing: a taxonomy of strategic and technological imperatives", *International Journal of Production Research*, Vol. 40, No. 6, pp. 1357-85.
- Haan, N., Devereux, S. and Maxwell, D. (2012), "Global implications of Somalia 2011 for famine prevention, mitigation and response", *Global Food Security*, Vol. 1, No. 1, pp. 74-9.
- Hair, J.F., Black, W.C., Babin, B.J., Anderson, R.E. and Tatham, R.L. (2006), *Multivariate data analysis*, Pearson Prentice Hall, Upper Saddle River, NJ.
- Hallgren, M. and Olhager, J. (2009), "Lean and agile manufacturing: external and internal drivers and performance outcomes", *International Journal of Operations and Production Management*, Vol. 29, No. 10, pp. 976-99.
- Handfield, R.B. and Nichols, E.L. (2002), *Supply chain redesign: transforming supply chains into integrated value systems*, Prentice Hall, Upper Saddle River, NJ.
- Handler Chayes, A., Chayes, A. and Raach, G. (1997), "Beyond reform: restructuring for more effective conflict intervention", *Global Governance*, Vol. 3, No. 2, pp. 117-45.
- HAP (2013), "Guide to the 2010 HAP standard in accountability and quality management", Humanitarian Accountability Partnership, available at: <http://www.hapinternational.org/pool/files/guide-to-the-2010-hap-standard-printer-friendly-version.pdf> (accessed 9 November 2015).
- Heaslip, G. (2012), "Challenges of civil military cooperation / coordination in humanitarian relief", in Kovács, G. and Spens, K. (Eds.), *Relief supply chain management for disasters*, IGI Global, Hershey, PA, pp. 147-71.
- Heaslip, G., Mangan, J. and Lalwani, C. (2007), "Integrating military and non governmental organisation (NGO) objectives in the humanitarian supply chain: a proposed framework", in Lalwani, C., Mangan, J., Butcher, T. and Coronado Mondragon, A.E. (Eds.), *Logistics Research Network Annual Conference, Kingston Upon Hull, UK, 5-7 September*.
- Heaslip, G., Sharif, A.M. and Althonayan, A. (2012), "Employing a systems-based perspective to the identification of inter-relationships within humanitarian logistics", *International Journal of Production Economics*, Vol. 139, No. 2, pp. 377-92.
- Heigh, I. and Jahre, M. (2010), "Humanitarian supply chains", *Supply Chain Forum: An International Journal*, Vol. 11, No. 3, pp. 2/3.
- Heil, K. and Droege, S.B. (2006), "Open and closed systems", in Helms, M.M. (Ed.), *Encyclopedia of management*, Cengage Gale, Farmington Hills, MI, pp. 596-8.

References

- Helfat, C.E., Finkelstein, S., Mitchell, W., Peteraf, M.A., Singh, H., Teece, D.J. and Winter, S.G. (2007), *Dynamic capabilities: understanding strategic change in organizations*, Blackwell Publishing, Malden, MA.
- Helfat, C.E. and Winter, S.G. (2011), "Untangling dynamic and operational capabilities: strategy for the (n)ever-changing world", *Strategic Management Journal*, Vol. 32, No. 11, pp. 1243-50.
- Hillbruner, C. and Moloney, G. (2012), "When early warning is not enough - Lessons learned from the 2011 Somalia famine", *Global Food Security*, Vol. 1, No. 1, pp. 20-8.
- Hills, A. (1998), "Seduced by recovery: the consequences of misunderstanding disaster", *Journal of Contingencies & Crisis Management*, Vol. 6, No. 3, pp. 162.
- Hobbs, C., Gordon, M. and Bogart, B. (2012), "When business is not as usual: decision-making and the humanitarian response to the famine in South Central Somalia", *Global Food Security*, Vol. 1, No. 1, pp. 50-6.
- Hofman, D. and Cecere, L. (2005), "The agile supply chain", *Supply Chain Management Review*, Vol. 9, No. 8, pp. 18-9.
- Holguín-Veras, J., Jaller, M., Van Wassenhove, L.N., Pérez, N. and Wachtendorf, T. (2012), "On the unique features of post-disaster humanitarian logistics", *Journal of Operations Management*, Vol. 30, No. 7, pp. 494-506.
- Howden, M. (2009), "How humanitarian logistics information systems can improve humanitarian supply chains: a view from the field", in Landgren, J. and Jul, S. (Eds.), *6th International ISCRAM Conference, Gothenburg, Sweden, 10-13 May*.
- Hsieh, H.-F. and Shannon, S.E. (2005), "Three approaches to qualitative content analysis", *Qualitative Health Research*, Vol. 15, No. 9, pp. 1277-88.
- Hughes, K. (2009), "The evolution of fully flexible supply chains", in Gattorna, J. (Ed.), *Dynamic supply chain alignment*, Gower Publishing Limited, Farnham, pp. 85-95.
- HUMLOG (2015), "HUMLOG bibliography", Hanken School of Economics, available at: <https://www.hanken.fi/en/about-hanken/organisation/departments-and-subjects/departments-marketing/humlog/publications-0> (accessed 9 November 2015).
- IRIN (2014), "NGO-NGO learning: what works?", Integrated Regional Information Networks, available at: <http://www.irinnews.org/report/99900/ngo-ngo-learning-what-works> (accessed 9 November 2015).
- Jahre, M. and Fabbe-Costes, N. (2015), "How standards and modularity can improve humanitarian supply chain responsiveness: the case of emergency response units", *Journal of Humanitarian Logistics and Supply Chain Management*, Vol. 5, No. 3, pp. 348-86.
- Jahre, M. and Jensen, L.-M. (2010), "Coordination in humanitarian logistics through clusters", *International Journal of Physical Distribution & Logistics Management*, Vol. 40, No. 8/9, pp. 657-74.
- Jahre, M., Jensen, L.-M. and Listou, T. (2009), "Theory development in humanitarian logistics: a framework and three cases", *Management Research News*, Vol. 32, No. 11, pp. 1008-23.
- James, E. (2008), *Managing humanitarian relief: an operational guide for NGOs*, Practical Action, Rugby.
- Jaspars, S. and Maxwell, D. (2008), "Targeting in complex emergencies: Somalia country case study", Feinstein International Center, available at: https://wikis.uit.tufts.edu/confluence/download/attachments/17107072/Somalia_08_09_16.pdf?version=1 (accessed 9 November 2015).
- Jick, T.D. (1979), "Mixing qualitative and quantitative methods: triangulation in action", *Administrative Science Quarterly*, Vol. 24, No. 4, pp. 602-11.
- Johansen, A.B. and Lie, E. (2011), "Optimising humanitarian response ", The Research Council of Norway, available at: http://www.forskningsradet.no/prognost-smartrans/Nyheter/Optimising_humanitarian_response/1253965603204/p1231248267240 (accessed 9 November 2015).
- Johnson, R.B. and Onwuegbuzie, A.J. (2004), "Mixed methods research: a research paradigm whose time has come", *Educational Researcher*, Vol. 33, No. 7, pp. 14-26.
- Kahn, M.E. (2005), "The death toll from natural disasters: the role of income, geography, and institutions", *The Review of Economics and Statistics*, Vol. 87, No. 2, pp. 271-84.
- Kast, F.E. and Rosenzweig, J.E. (1972), "General systems theory: applications for organization and management", *Academy of Management Journal*, Vol. 15, No. 4, pp. 447-65.
- Katz, D. and Kahn, R.L. (1978), *The social psychology of organizations*, John Wiley & Sons, Hoboken, NJ.

- Kent, R.C. (2011), "Planning from the future: an emerging agenda", *International Review of the Red Cross*, Vol. 93, No. 884, pp. 939-63.
- Ketokivi, M. and Choi, T. (2014), "Renaissance of case research as a scientific method", *Journal of Operations Management*, Vol. 32, No. 5, pp. 232-40.
- Kidd, P.T. (1994), *Agile manufacturing: forging new frontiers*, Addison-Wesley, Reading, MA.
- Kim, J.J. and Guha-Sapir, D. (2012), "Famines in Africa: is early warning early enough?", *Global Health Action*, Vol. 5, pp. 1-3.
- Kleindorfer, P.R. and Saad, G.H. (2005), "Managing disruption risks in supply chains", *Production and operations management*, Vol. 14, No. 1, pp. 53-68.
- Kleiner, A. (2013), "The dynamic capabilities of David Teece", Booz & Company, available at: <http://www.strategy-business.com/article/00225?pg=all> (accessed 9 November 2015).
- Kline, R.B. (2005), *Principles and practice of structural equation modeling*, The Guilford Press, New York, NY.
- Knee, R. (1999), "Shipping to Africa", *World Trade*, Vol. 12, No. 1, pp. 88-9.
- Kohlbacher, F. (2006), "The use of qualitative content analysis in case study research", *Forum: Qualitative Social Research*, Vol. 7, No. 1, Art. 21.
- Komrska, J., Kopczak, L.R. and Swaminathan, J.M. (2013), "When supply chains save lives", *Supply Chain Management Review*, Vol. 17, No. 1, pp. 42-9.
- Kovács, G. (2011), "So where next? Developments in humanitarian logistics", in Christopher, M.G. and Tatham, P.H. (Eds.), *Humanitarian logistics*, Kogan Page Limited, London, UK, pp. 249-63.
- Kovács, G., Buatsi, S. and Spens, K. (2007), "Challenges of humanitarian logistics in Ghana", in Tatham, P. (Ed.), *International Humanitarian Logistic Symposium, Faringdon, UK, 19-20 November*.
- Kovács, G. and Spens, K.M. (2007), "Humanitarian logistics in disaster relief operations", *International Journal of Physical Distribution & Logistics Management*, Vol. 37, No. 2, pp. 99-114.
- Kovács, G. and Spens, K.M. (2008), "Humanitarian logistics revisited", in Stentoft Arlbjørn, J., Halldórsson, Á., Jahre, M. and Spens, K. (Eds.), *Northern lights in logistics & supply chain management*, Copenhagen Business School Press, Copenhagen, pp. 217-32.
- Kovács, G. and Spens, K.M. (2009), "Identifying challenges in humanitarian logistics", *International Journal of Physical Distribution & Logistics Management*, Vol. 39, No. 6, pp. 506-28.
- Kovács, G. and Spens, K.M. (2011a), "Humanitarian logistics and supply chain management: the start of a new journal", *Journal of Humanitarian Logistics and Supply Chain Management*, Vol. 1, No. 1, pp. 5-14.
- Kovács, G. and Spens, K.M. (2011b), "Trends and developments in humanitarian logistics - A gap analysis", *International Journal of Physical Distribution & Logistics Management*, Vol. 41, No. 1, pp. 32-45.
- Kovács, G. and Tatham, P.H. (2009), "Responding to disruptions in the supply network - From dormant to action", *Journal of Business Logistics*, Vol. 30, No. 2, pp. 215-29.
- Kovács, G., Tatham, P.H. and Larson, P.D. (2012), "What skills are needed to be a humanitarian logistician?", *Journal of Business Logistics*, Vol. 33, No. 3, pp. 245-58.
- Kreps, G.A. (1989), "Future directions in disaster research: the role of taxonomy", *International Journal of Mass Emergencies and Disasters*, Vol. 7, No. 3, pp. 215-41.
- Krippendorff, K. (2004), *Content analysis*, Sage Publications, Thousand Oaks, CA.
- Kruke, B.I. and Olsen, O.E. (2012), "Knowledge creation and reliable decision-making in complex emergencies", *Disasters*, Vol. 36, No. 2, pp. 212-32.
- Kunz, N. and Reiner, G. (2012), "A meta-analysis of humanitarian logistics research", *Journal of Humanitarian Logistics and Supply Chain Management*, Vol. 2, No. 2, pp. 116-47.
- L'Hermitte, C., Bowles, M. and Tatham, P.H. (2013), "A new classification model of disasters based on their logistics implications", in Lane, R. and Kahn, D. (Eds.), *11th ANZAM Operations, Supply Chain and Services Management Symposium, Brisbane, Australia, 20-21 June*.
- L'Hermitte, C., Bowles, M., Tatham, P.H. and Brooks, B. (2015), "An integrated approach to agility in humanitarian logistics", *Journal of Humanitarian Logistics and Supply Chain Management*, Vol. 5, No. 2, pp. 209-33.

References

- L'Hermitte, C., Brooks, B., Bowles, M. and Tatham, P.H. (201x), "Investigating the strategic antecedents of agility in humanitarian logistics", *Disasters*, pp. Accepted for publication.
- L'Hermitte, C., Tatham, P.H. and Bowles, M. (2014), "Classifying logistics-relevant disasters: conceptual model and empirical illustration", *Journal of Humanitarian Logistics and Supply Chain Management*, Vol. 4, No. 2, pp. 155-78.
- L'Hermitte, C., Tatham, P.H., Bowles, M. and Brooks, B. (2016), "Developing organisational capabilities to support agility in humanitarian logistics: an exploratory study", *Journal of Humanitarian Logistics and Supply Chain Management*, Vol. 6, No. 1, pp. 72-99.
- L'Hermitte, C., Tatham, P.H., Brooks, B. and Bowles, M. (2016), "Supply chain agility in humanitarian protracted operations", *Journal of Humanitarian Logistics and Supply Chain Management*, Vol. 6, No. 2, Accepted for publication.
- Larson, P.D. (2011), "Risky business: what humanitarians can learn from business logisticians - and vice versa", in Christopher, M.G. and Tatham, P.H. (Eds.), *Humanitarian logistics*, Kogan Page, London, pp. 15-31.
- Larson, P.D. (2014), "An improvement process for process improvement", in Tatham, P.H. and Christopher, M.G. (Eds.), *Humanitarian Logistics*, Kogan Page, London, pp. 19-39.
- Larson, P.D. and Halldórsson, Á. (2004), "Logistics versus supply chain management: An international survey", *International Journal of Logistics Research and Applications*, Vol. 7, No. 1, pp. 17-31.
- Larson, P.D., Poist, R.F. and Halldórsson, Á. (2007), "Perspectives on logistics vs. SCM: a survey of SCM professionals", *Journal of Business Logistics*, Vol. 28, No. 1, pp. 1-24.
- Lautze, S., Bell, W., Alinovi, L. and Russo, L. (2012), "Early warning, late response (again): the 2011 famine in Somalia", *Global Food Security*, Vol. 1, No. 1, pp. 43-9.
- Lee, H.L. (2004), "The triple-A supply chain", *Harvard Business Review*, Vol. 82, No. 10, pp. 102-12.
- Leiras, A., de Brito Jr, I., Queiroz Peres, E., Rejane Bertazzo, T. and Tsugunobu Yoshida Yoshizaki, H. (2014), "Literature review of humanitarian logistics research: trends and challenges", *Journal of Humanitarian Logistics and Supply Chain Management*, Vol. 4, No. 1, pp. 95-130.
- Levine, S., Crosskey, A. and Abdinoor, M. (2011), "System failure? Revisiting the problems of timely response to crises in the Horn of Africa", Humanitarian Policy Group and Overseas Development Institute, available at: <http://www.odihpn.org/hpn-resources/network-papers/system-failure-revisiting-the-problems-of-timely-response-to-crises-in-the-horn-of-africa> (accessed 9 November 2015).
- Li, X., Chen, C., Goldsby, T.J. and Holsapple, C.W. (2008), "A unified model of supply chain agility: the work-design perspective", *International Journal of Logistics Management*, Vol. 19, No. 3, pp. 408-35.
- Lind, D.A., Marchal, W.G. and Wathen, S.A. (2015), *Statistical techniques in business and economics*, McGraw-Hill, New York, NY.
- Little, R.J.A. (1988), "A test of missing completely at random for multivariate data with missing values", *Journal of the American Statistical Association*, Vol. 83, No. 404, pp. 1198-202.
- Lockett, A., Thompson, S. and Morgenstern, U. (2009), "The development of the resource-based view of the firm: a critical appraisal", *International Journal of Management Reviews*, Vol. 11, No. 1, pp. 9-28.
- Logistics Cluster (2011), "Horn of Africa - Logistics infrastructures and food insecurity areas", available at: <http://www.logcluster.org/ops/som11a/horn-of-africa-logistics-infrastructures-and-food-insecurity-areas> (accessed 9 November 2015).
- Logistics Cluster (2013a), "Distribution", *Logistics operational guide*, available at: <http://log.logcluster.org/response/distribution/index.html> (accessed 9 November 2015).
- Logistics Cluster (2013b), "The LET: an invaluable partnership", available at: <http://www.logcluster.org/blog/let-invaluable-partnership> (accessed 9 November 2015).
- Logistics Cluster (2013c), "Quality control", *Logistics operational guide*, available at: <http://log.logcluster.org/response/quality-control/index.html> (accessed 9 November 2015).
- Logistics Cluster (2015a), "About the Logistics Cluster", available at: <http://www.logcluster.org/logistics-cluster> (accessed 9 November 2015).
- Logistics Cluster (2015b), "Nepal - Concept of Operations", available at: http://www.logcluster.org/sites/default/files/logistics_cluster_nepal_conops_150426_v2.pdf (accessed 9 November 2015).

- Logistics Manager (2014), "Revealed: all the awards winners", available at: <http://www.logisticsmanager.com/2014/11/22827-revealed-all-the-awards-winners/> (accessed 9 November 2015).
- Long, D.C. and Wood, D.F. (1995), "The logistics of famine relief", *Journal of Business Logistics*, Vol. 16, No. 1, pp. 213-29.
- Lounsbury, J.W., Gibson, L.W. and Saudargas, R.A. (2006), "Scale development", in Leong, F.T.L. and Austin, J.T. (Eds.), *The psychology research handbook*, Sage Publications, Thousand Oaks, CA, pp. 125-46.
- Lu, Q., Goh, M. and De Souza, R. (2013), "Learning mechanisms for humanitarian logistics", *Journal of Humanitarian Logistics and Supply Chain Management*, Vol. 3, No. 2, pp. 149-60.
- Ludema, M.W. and Ross, H.B. (2000), "Military and civil logistic support of humanitarian relief operations", *10th International Council on Systems Engineering (INCOSE) Annual International Symposium*, Minneapolis, MN, 16-20 July.
- Luhmann, N. (1995), *Social systems*, Stanford University Press, Stanford, CA.
- Maiola, A.-L. (2007), "Médecins Sans Frontières et la gestion des catastrophes naturelles : standardisation et limites de la logistique en situation d'urgence", *Mondes en développement*, Vol. 1, No. 137, pp. 81-8.
- Manuj, I., Dittmann, J.P. and Gaudenzi, B. (2007), "Risk management", in Mentzer, J.T., Myers, M.B. and Stank, T.P. (Eds.), *Handbook of global supply chain management*, Sage Publications, Thousand Oaks, CA, pp. 319-36.
- Manuj, I. and Mentzer, J.T. (2008), "Global supply chain risk management", *Journal of Business Logistics*, Vol. 29, No. 1, pp. 133-55.
- Maon, F., Lindgreen, A. and Vanhamme, J. (2009), "Developing supply chains in disaster relief operations through cross-sector socially oriented collaborations: a theoretical model", *Supply Chain Management: An International Journal*, Vol. 14, No. 2, pp. 149-64.
- Maskell, J. (2001), "The age of agile manufacturing", *Supply Chain Forum: An International Journal*, Vol. 6, No. 1, pp. 5-11.
- Maxwell, D., Bailey, S., Harvey, P., Walker, P., Sharbatke-Church, C. and Savage, K. (2012a), "Preventing corruption in humanitarian assistance: perceptions, gaps and challenges", *Disasters*, Vol. 36, No. 1, pp. 140-60.
- Maxwell, D. and Fitzpatrick, M. (2012), "The 2011 Somalia famine: context, causes, and complications", *Global Food Security*, Vol. 1, No. 1, pp. 5-12.
- Maxwell, D., Haan, N., Gelsdorf, K. and Dawe, D. (2012b), "The 2011–12 famine in Somalia: introduction to the special edition", *Global Food Security*, Vol. 1, No. 1, pp. 1-4.
- McCann, J., Selsky, J. and Lee, J. (2009), "Building agility, resilience and performance in turbulent environments", *People & Strategy*, Vol. 32, No. 3, pp. 44-51.
- McCann, J.E. and Selsky, J.W. (2012), *Mastering turbulence: the essential capabilities of agile and resilient individuals, teams and organizations*, Jossey-Bass, San Francisco, CA.
- McGill, M.E., Slocum Jr., J.W. and David, L. (1992), "Management practices in learning organizations", *Organizational Dynamics*, Vol. 21, No. 1, pp. 5-17.
- McGuire, G. (2011), "Handbook of humanitarian healthcare logistics", available at: <http://www.humanitarianhealthcarelogistics.com/handbook.htm> (accessed 9 November 2015).
- McKinney, J.C. (1966), *Constructive typology and social theory*, Meredith Publishing Company, New York, NY.
- McKinney, J.C. (1969), "Typification, typologies, and sociological theory", *Social Forces*, Vol. 48, No. 1, pp. 1-12.
- McKinsey & Company (2006), "Building a nimble organization", *McKinsey Quarterly*, June, available at: <http://leadway.org/PDF/Building%20A%20Nimble%20Organization.pdf> (accessed 9 November 2015).
- McLachlin, R., Larson, P.D. and Khan, S. (2009), "Not-for-profit supply chains in interrupted environments", *Management Research News*, Vol. 32, No. 11, pp. 1050-64.
- Meade, A.W. and Craig, S.B. (2012), "Identifying careless responses in survey data", *Psychological Methods*, Vol. 17, No. 3, pp. 437-55.
- Menkhaus, K. (2012), "No access: critical bottlenecks in the 2011 Somali famine", *Global Food Security*, Vol. 1, No. 1, pp. 29-35.
- Mentzer, J.T. and Konrad, P.B. (1991), "An efficiency/effectiveness approach to logistics performance analysis", *Journal of Business Logistics*, Vol. 12, No. 1, pp. 33-61.

References

- Merminod, N., Nollet, J. and Pache, G. (2014), "Streamlining humanitarian and peacekeeping supply chains", *Society and Business Review*, Vol. 9, No. 1, pp. 4-22.
- Metcalf, V., Martin, E. and Pantuliano, S. (2011), "Risk in humanitarian action: towards a common approach?", Humanitarian Policy Group and Overseas Development Institute, available at: <http://www.odi.org/publications/5463-risk-common-action-humanitarian-approach-management> (accessed 9 November 2015).
- Mitroff, I.I. and Alpaslan, M.C. (2003), "Preparing for evil", *Harvard Business Review*, Vol. 81, No. 4, pp. 109-15.
- MSF (2015), "What is Médecins sans Frontières", Médecins Sans Frontières, available at: <http://www.msf.org.au/about-msf/what-is-msf.html> (accessed 9 November 2015).
- Neuman, W.L. (2012), *Basics of social research: qualitative and quantitative approaches*, Pearson Education, Boston, MA.
- Nikbakhsh, E. and Farahani, R. (2011), "Humanitarian logistics planning in disaster relief operations", in Farahani, R., Rezapour, S. and Kardar, L. (Eds.), *Logistics operations and management: concepts and models*, Elsevier, London, pp. 291-332.
- Nonaka, I. (1998), "The knowledge-creating company", in Neef, D., Siesfeld, G.A. and Cefola, J. (Eds.), *The economic impact of knowledge*, Butterworth-Heinemann, Boston, MA, pp. 175-87.
- Nonaka, I. and Takeuchi, H. (1995), *The knowledge-creating company*, Oxford University Press, Oxford.
- O'Reilly, C.A. and Tushman, M.L. (2008), "Ambidexterity as a dynamic capability: resolving the innovator's dilemma", *Research in Organizational Behavior*, Vol. 28, pp. 185-206.
- OCFA (2011), *Humanitarian country profile - Somalia*, Office for the Coordination of Foreign Aid, Abu Dhabi, United Arab Emirates.
- OCHA (2011), "Humanitarian requirements for the Horn of Africa drought", United Nations Office for the Coordination of Humanitarian Affairs, available at: https://docs.unocha.org/sites/dms/CAP/HRD_2011_Horn_of_Africa_SCREEN.pdf (accessed 9 November 2015).
- OCHA (2012), "Risk, adaptation and innovation in humanitarian action", United Nations Office for the Coordination of Humanitarian Affairs, available at: <https://docs.unocha.org/sites/dms/Documents/Final%20-%20OCHA%202011%20Policy%20and%20Research%20Conference%20Report%2025%20January%202012.pdf> (accessed 9 November 2015).
- Olavarrieta, S. and Ellinger, A.E. (1997), "Resource-based theory and strategic logistics research", *International Journal of Physical Distribution & Logistics Management*, Vol. 27, No. 9/10, pp. 559-87.
- Oloruntoba, R. and Gray, R. (2006), "Humanitarian aid: an agile supply chain?", *Supply Chain Management*, Vol. 11, No. 2, pp. 115-20.
- Oloruntoba, R. and Kovács, G. (2015), "A commentary on agility in humanitarian aid supply chains", *Supply Chain Forum: an International Journal*, Vol. 20, No. 6, pp. 708 - 16.
- Olson, K. (2011), *Essentials of qualitative interviewing*, Left Coast Press, Walnut Creek, CA.
- Overstreet, R.E., Hall, D., Hanna, J.B. and Kelly Rainer, R. (2011), "Research in humanitarian logistics", *Journal of Humanitarian Logistics and Supply Chain Management*, Vol. 1, No. 2, pp. 114-31.
- Oxfam (2012), "Food crisis in the Horn of Africa", Oxfam International, available at: <http://www.oxfam.org/sites/www.oxfam.org/files/er-horn-of-africa-2011-2012-progress-report-050712-en.pdf> (accessed 9 November 2015).
- Pagell, M. and Wu, Z. (2009), "Building a more complete theory of sustainable supply chain management using case studies of 10 exemplars", *Journal of Supply Chain Management*, Vol. 45, No. 2, pp. 37-56.
- PAHO (2001), "Humanitarian supply management in logistics in the health sector", Pan American Health Organization, available at: <http://www.paho.org/english/ped/HumanitarianSupply.pdf> (accessed 9 November 2015).
- Park, Y., Hong, P. and Roh, J.J. (2013), "Supply chain lessons from the catastrophic natural disaster in Japan", *Business Horizons*, Vol. 56, No. 1, pp. 75-85.
- Peck, H. (2012), "Supply chain vulnerability, risk, robustness and resilience", in Mangan, J., Lalwani, C., Butcher, T. and Javadpour, R. (Eds.), *Global logistics and supply chain management*, John Wiley & Sons, Chichester, pp. 307-25.

- Pedraza-Martinez, A.J., Stapleton, O. and van Wassenhove, L.N. (2013), "On the use of evidence in humanitarian logistics research", *Disasters*, Vol. 37, No. 1, pp. S51-S67.
- Pellissier, R. (2007), *Business research made easy*, Juta, Cape Town.
- Perry, R.W. (1998), "Definitions and the development of a theoretical superstructure for disaster research", in Quarantelli, E.L. (Ed.), *What is a disaster? Perspectives on the question*, Routledge, London, pp. 197-215.
- Perry, R.W. (2005), "Disasters, definitions and theory construction", in Perry, R.W. and Quarantelli, E.L. (Eds.), *What is a disaster? New answers to old questions*, International Research Committee on Disasters, University of Delaware, Newark, DE, pp. 311-24.
- Pettit, S. and Beresford, A. (2005), "Emergency relief logistics: an evaluation of military, non-military and composite response models", *International Journal of Logistics: Research and Applications*, Vol. 8, No. 4, pp. 313-31.
- Pettit, S. and Beresford, A. (2009), "Critical success factors in the context of humanitarian aid supply chains", *International Journal of Physical Distribution & Logistics Management*, Vol. 39, No. 6, pp. 450-68.
- Pfohl, H.-C., Gallus, P. and Thomas, D. (2011), "Interpretive structural modeling of supply chain risks", *International Journal of Physical Distribution & Logistics Management*, Vol. 41, No. 9, pp. 839-59.
- Podsakoff, P.M., MacKenzie, S.B., Lee, J.-Y. and Podsakoff, N.P. (2003), "Common method biases in behavioral research: a critical review of the literature and recommended remedies.", *Journal of Applied Psychology*, Vol. 88, No. 5, pp. 879-903.
- Ponomarov, S.Y. and Holcomb, M.C. (2009), "Understanding the concept of supply chain resilience", *International Journal of Logistics Management*, Vol. 20, No. 1, pp. 124-43.
- Power, D.J., Sohal, A.S. and Shams-Ur, R. (2001), "Critical success factors in agile supply chain management: an empirical study", *International Journal of Physical Distribution & Logistics Management*, Vol. 31, No. 4, pp. 247-65.
- Prater, E., Biehl, M. and Smith, M.A. (2001), "International supply chain agility: tradeoffs between flexibility and uncertainty", *International Journal of Operations & Production Management*, Vol. 21, No. 5-6, pp. 823-39.
- Priem, R.L. and Butler, J.E. (2001), "Is the resource-based 'view' a useful perspective for strategic management research?", *The Academy of Management Review*, Vol. 26, No. 1, pp. 22-40.
- Provitolo, D. (2009), "A new classification of catastrophes based on 'Complexity Criteria'", in Aziz-Alaoui, M.A. and Bertelle, C. (Eds.), *From system complexity to emergent properties*, Springer, Berlin/Heidelberg, pp. 179-94.
- Quarantelli, E.L. (1991), "Disaster response: generic or agent-specific?", in Kreimer, A. and Munasinghe, M. (Eds.), *Managing natural disasters and the environment*, The World Bank, Washington, DC, pp. 97-105.
- Quarantelli, E.L. (1998), "Where we have been and where we might go", in Quarantelli, E.L. (Ed.), *What is a disaster? Perspectives on the question*, Routledge, London, pp. 234-73.
- Quarantelli, E.L. (2000), "Emergencies, disasters and catastrophes are different phenomena", Disaster Research Center, University of Delaware, available at: <http://dspace.udel.edu:8080/dspace/handle/19716/674> (accessed 9 November 2015).
- Ramalingam, B., Scriven, K. and Foley, C. (2009), "Innovations in international humanitarian action", *8th review of humanitarian action*, ANALP, available at: <http://www.alnap.org/resource/5664.aspx> (accessed 9 November 2015).
- Rao, S. and Goldsby, T.J. (2009), "Supply chain risks: a review and typology", *International Journal of Logistics Management*, Vol. 20, No. 1, pp. 97-123.
- Razzaque, M.A. (1997), "Challenges to logistics development: the case of a Third World country - Bangladesh", *International Journal of Physical Distribution & Logistics Management*, Vol. 27, No. 1, pp. 18-38.
- Redding, J.C. and Catalanello, R.F. (1994), *Strategic readiness: the making of the learning organization*, Jossey-Bass, San Francisco, CA.
- Redvers, L. (2014), "Time for re-think on humanitarian funding?", Integrated Regional Information Networks, available at: <http://www.irinnews.org/report/100945/time-for-re-think-on-humanitarian-funding> (accessed 9 November 2015).
- Redvers, L. (2015), "It's all about the money", Integrated Regional Information Networks, available at: <http://www.irinnews.org/report/101694/it-s-all-about-the-money> (accessed 9 November 2015).

References

- Relief Web (2008), "Glossary of humanitarian terms", United Nations Office for the Coordination of Humanitarian Affairs, available at: http://reliefweb.int/sites/reliefweb.int/files/resources/4F99A3C28EC37D0EC12574A4002E89B4-reliefweb_aug2008.pdf (accessed 9 November 2015).
- Richardson, B. (1994), "Crisis management and management strategy-time to "loop the loop"?", *Disaster Prevention and Management*, Vol. 3, No. 3, pp. 59-80.
- Robson, C. (2011), *Real world research*, John Wiley & Sons, Chichester.
- Rodrigue, J.-P., Comtois, C. and Slack, B. (2009), *The geography of transport systems*, Routledge, New York, NY.
- Rosenthal, U. (1998), "Future disasters, future definitions", in Quarantelli, E.L. (Ed.), *What is a disaster? Perspectives on the question*, Routledge, London, pp. 146-59.
- Roth, A.V. (1996), "Neo-operations strategy - Linking capabilities-based competition to technology", in Gaynor, G.H. (Ed.), *Handbook of technology management*, McGraw-Hill, New York, NY, pp. 38.1-44.
- Saavedra, L. and Knox-Clarke, P. (2015), "Working together in the field for effective humanitarian response", ALNAP, available at: <http://www.alnap.org/resource/19489> (accessed 9 November 2015).
- Sanchez, L.M. and Nagi, R. (2001), "A review of agile manufacturing systems", *International Journal of Production Research*, Vol. 39, No. 16, pp. 3561-600.
- Sandri, G. (1969), "On the logic of classification", *Quality and Quantity*, Vol. 3, No. 1-2, pp. 80-124.
- Saunders, M., Lewis, P. and Thornhill, A. (2009), *Research methods for business students*, Pearson Education, Harlow.
- Save the Children (2015), "Creating better lives for children", available at: <http://www.savethechildren.org.au/about-us/who-we-are> (accessed 9 November 2015).
- Schilling, J. (2006), "On the pragmatics of qualitative assessment designing the process for content analysis", *European Journal of Psychological Assessment*, Vol. 22, No. 1, pp. 28-37.
- Scholten, K., Sharkey Scott, P. and Fynes, B. (2010), "(Le)agility in humanitarian aid (NGO) supply chains", *International Journal of Physical Distribution & Logistics Management*, Vol. 40, No. 8/9, pp. 623-35.
- Scholten, K., Sharkey Scott, P. and Fynes, B. (2014), "Mitigation processes - Antecedents for building supply chain resilience", *Supply Chain Management: An International Journal*, Vol. 19, No. 2, pp. 211-28.
- Schulz, S.F. (2008), "Disaster relief logistics: benefits and impediments to horizontal cooperation between humanitarian organizations", University of Technology, Berlin, available at: http://opus.kobv.de/tuberlin/volltexte/2009/2121/pdf/schulz_sabine.pdf (accessed 9 November 2015).
- Schumacker, R.E. and Lomax, R.G. (2010), *A beginner's guide to structural equation modeling*, Routledge, New York, NY.
- Schwaber, K. (2004), *Agile project management with Scrum*, Microsoft Press, Redmond, WA.
- Schwaber, K. and Sutherland, J. (2013), "The Scrum guide", Scrum.org, available at: <http://www.scrumguides.org/docs/scrumguide/v1/Scrum-Guide-US.pdf#zoom=100> (accessed 9 November 2015).
- Seal, A. and Bailey, R. (2013), "The 2011 famine in Somalia: lessons learnt from a failed response?", *Conflict and Health*, Vol. 7, No. 1, pp. 22-6.
- Senge, P.M. (2006), *The fifth discipline*, Random House, London.
- Seuring, S. (2005), "Case study research in supply chains - An outline and three examples", in Kotzab, H., Seuring, S., Müller, M. and Reiner, G. (Eds.), *Research methodologies in supply chain management*, Physica-Verlag, Heidelberg, pp. 236-50.
- Shah, R. and Goldstein, S.M. (2006), "Use of structural equation modeling in operations management research: looking back and forward", *Journal of Operations Management*, Vol. 24, No. 2, pp. 148-69.
- Shahabi, K., Cusumano, A. and Sohonie, S. (2015), "Agility is within reach", Strategy+Business, PwC Strategy, available at: http://www.strategy-business.com/media/file/00316_Agility-Is_Within_Reach.pdf (accessed 9 November 2015).
- Shaluf, I.M. (2007), "Disaster types", *Disaster Prevention and Management*, Vol. 16, No. 5, pp. 704-17.
- Sharifi, H. and Zhang, Z. (2001), "Agile manufacturing in practice: application of a methodology", *International Journal of Operations & Production Management*, Vol. 21, No. 5/6, pp. 772-94.
- Sheffi, Y. and Rice Jr., J.B. (2005), "A supply chain view of the resilient enterprise", *MIT Sloan Management Review*, Vol. 47, No. 1, pp. 41-8.

- Sherehiy, B., Karwowski, W. and Layer, J.K. (2007), "A review of enterprise agility: concepts, frameworks, and attributes", *International Journal of Industrial Ergonomics*, Vol. 37, No. 5, pp. 445–60.
- Shirky, C. (2011), *Cognitive surplus: creativity and generosity in a connected age*, Penguin Books, London.
- Shook, C.L., Ketchen, D.J., Hult, G.T.M. and Kacmar, K.M. (2004), "An assessment of the use of structural equation modeling in strategic management research", *Strategic Management Journal*, Vol. 25, No. 4, pp. 397-404.
- Simonović, S.P. (2011), *Systems approach to management of disasters: methods and applications*, John Wiley & Sons, Hoboken, NJ.
- Simons, H. (2009), *Case study research in practice*, Sage Publications, London.
- Sodhi, M.S. and Lee, S. (2007), "An analysis of sources of risk in the consumer electronics industry", *The Journal of the Operational Research Society*, Vol. 58, No. 11, pp. 1430-9.
- Sodhi, M.S., Son, B.G. and Tang, C.S. (2012), "Researchers' perspectives on supply chain risk management", *Production and operations management*, Vol. 21, No. 1, pp. 1-13.
- Sodhi, M.S. and Tang, C.S. (2012), *Managing supply chain risk*, Springer, New York, NY.
- Somers, S. (2009), "Measuring resilience potential: an adaptive strategy for organizational crisis planning", *Journal of Contingencies & Crisis Management*, Vol. 17, No. 1, pp. 12-23.
- Starr, M.K., Van Wassenhove, L.N., Apte, A., Goncalves, P., Gupta, S. and Yadav, P. (2012), "Special issue of production and operations management: humanitarian operations and crisis management", *Production and Operations Management*, Vol. 21, No. 1, pp. 209-10.
- Stephenson, R.S. (1994), "Disasters and development", United Nations Development Programme, available at: http://www.pacificdisaster.net/pdnadmin/data/original/dmtp_15_disasters_development_8.pdf (accessed 9 November 2015).
- Stoddard, A., Harmer, A. and DiDomenico, V. (2009), "Providing aid in insecure environments: 2009 update", Overseas Development Institute and Humanitarian Policy Group, available at: <http://www.odg.org.uk/sites/odi.org.uk/files/odi-assets/publications-opinion-files/4243.pdf> (accessed 9 November 2015).
- Stoddard, A., Harmer, A. and Haver, K. (2006), "Providing aid in insecure environment: trends in policy and operations", Overseas Development Institute and Humanitarian Policy Group, available at: <http://www.odg.org.uk/sites/odi.org.uk/files/odi-assets/publications-opinion-files/269.pdf> (accessed 9 November 2015).
- Streiner, D.L., Norman, G.R. and Cairney, J. (2015), *Health measurement scales : a practical guide to their development and use*, Oxford University Press, Oxford.
- Sue, V.M. and Ritter, L.A. (2007), *Conducting online surveys*, Sage Publications, Thousand Oaks, CA.
- Sull, D.N. (2009), *The upside of turbulence: seizing opportunity in an uncertain world*, Harper Collins, New York, NY.
- Sullivan, A.K. (2010), "Piracy in the Horn of Africa and its effects on the global supply chain", *Journal of Transportation Security*, Vol. 3, No. 4, pp. 231-43.
- Swafford, P.M., Ghosh, S. and Murthy, N. (2005), "The antecedents of supply chain agility of a firm: scale development and model testing", *Journal of Operations Management*, Vol. 24, No. 2, pp. 170-88.
- Tabachnick, B.G. and Fidell, L.S. (2007), *Using multivariate statistics*, Pearson Education, Boston, MA.
- Tabaklar, T., Halldórsson, Á., Kovács, G. and Spens, K. (2015), "Borrowing theories in humanitarian supply chain management", *Journal of Humanitarian Logistics and Supply Chain Management*, Vol. 5, No. 3, pp. 281 - 99.
- Tang, C.S. (2006), "Perspectives in supply chain risk management", *International Journal of Production Economics*, Vol. 103, No. 2, pp. 451-88.
- Tang, C.S. and Tomlin, B. (2008), "The power of flexibility for mitigating supply chain risks", *International Journal of Production Economics*, Vol. 116, No. 1, pp. 12-27.
- Tatham, P.H. (2009), "The logistic implications of rapid and not-so-rapid onset disasters", *2nd International Humanitarian Logistic Symposium, Faringdon, UK, 25-26 March*.
- Tatham, P.H. and Christopher, M.G. (2014), "Introduction", in Tatham, P.H. and Christopher, M.G. (Eds.), *Humanitarian logistics*, Kogan Page, London, pp. 1-18.

References

- Tatham, P.H., Haavisto, I., Kovács, G., Beresford, A. and Pettit, S. (2010), "The logistic cost drivers of disaster relief", in Whiteing, T. (Ed.), *15th Logistics Research Network (LRN) Conference, Leeds, UK, 8-10 September*.
- Tatham, P.H. and Houghton, L. (2011), "The wicked problem of humanitarian logistics and disaster relief aid", *Journal of Humanitarian Logistics and Supply Chain Management*, Vol. 1, No. 1, pp. 15-31.
- Tatham, P.H. and Kovács, G. (2007), "The humanitarian supply network in rapid onset disasters", *19th NOFOMA Conference, Reykjavik, Iceland*.
- Tatham, P.H. and Kovács, G. (2010), "The application of "swift trust" to humanitarian logistics", *International Journal of Production Economics*, Vol. 126, No. 1, pp. 35-45.
- Tatham, P.H. and Kovács, G. (2012), "Developing and maintaining trust in hastily formed relief networks", in Kovács, G. and Spens, K. (Eds.), *Relief supply chain management for disasters*, IGI Global, Hershey, PA, pp. 173-95.
- Tatham, P.H., L'Hermitte, C., Spens, K.M. and Kovács, G. (2013), "Humanitarian logistics: development of an improved classification framework", in Lane, R. and Kahn, D. (Eds.), *11th ANZAM Operations, Supply Chain and Services Management Symposium, Brisbane, Australia, 20-21 June*.
- Tatham, P.H., Loy, J. and Peretti, U. (2015), "Three dimensional printing - A key tool for the humanitarian logistician?", *Journal of Humanitarian Logistics and Supply Chain Management*, Vol. 5, No. 2, pp. 188-208.
- Tatham, P.H. and Pettit, S.J. (2010), "Transforming humanitarian logistics: the journey to supply network management", *International Journal of Physical Distribution & Logistics Management*, Vol. 40, No. 8/9, pp. 609-22.
- Tatham, P.H. and Rietjens, S.J.H. (2016), "Integrated disaster relief logistics: a stepping stone towards viable civil-military networks", *Disasters*, Vol. 40, No. 1, pp. 7-25.
- Tatham, P.H. and Spens, K.M. (2011), "Towards a humanitarian logistics knowledge management system", *Disaster Prevention & Management*, Vol. 20, No. 1, pp. 6-26.
- Tatham, P.H., Spens, K.M. and Taylor, D. (2009), "Development of the academic contribution to humanitarian logistics and supply chain management", *Management Research News*, Vol. 32, No. 11.
- Taylor, D. and Pettit, S. (2009), "A consideration of the relevance of lean supply chain concepts for humanitarian aid provision", *International Journal of Services Technology and Management*, Vol. 12, No. 4, pp. 430-44.
- Teece, D.J. (2000), "Strategies for managing knowledge assets: the role of firm structure and industrial context", *Long Range Planning*, Vol. 33, No. 1, pp. 35-54.
- Teece, D.J. (2007), "Explicating dynamic capabilities: the nature and microfoundations of (sustainable) enterprise performance", *Strategic Management Journal*, Vol. 28, No. 13, pp. 1319-50.
- Teece, D.J. (2009), *Dynamic capabilities and strategic management*, Oxford University Press, Oxford.
- Teece, D.J. (2012), "Dynamic capabilities: routines versus entrepreneurial action", *Journal of Management Studies*, Vol. 49, No. 8, pp. 1395-401.
- Teece, D.J. and Pisano, G. (1994), "The dynamic capabilities of firms: an introduction", *Industrial and Corporate Change*, Vol. 3, No. 3, pp. 537-56.
- Teece, D.J., Pisano, G. and Shuen, A. (1997), "Dynamic capabilities and strategic management", *Strategic Management Journal*, Vol. 18, No. 7, pp. 509-33.
- Thomas, A.S. and Fritz, L. (2006), "Disaster Relief, Inc.", *Harvard Business Review*, Vol. 84, No. 11, pp. 114-22.
- Thomas, A.S. and Kopczak, L.R. (2005), "From logistics to supply chain management: the path forward in the humanitarian sector", Fritz Institute, available at: <http://www.fritzinstitute.org/pdfs/whitepaper/from-logisticsto.pdf> (accessed 9 November 2015).
- Thomas, A.S. and Mizushima, M. (2005), "Logistics training: necessity of luxury?", *Forced Migration Review*, Vol. 22, pp. 60-1.
- Thompson, J.D. (1967), *Organizations in action: social science bases of administrative theory*, McGraw-Hill, New York, NY.
- Thompson, S., Altay, N., Green III, W.G. and Lapetina, J. (2006), "Improving disaster response efforts with decision support systems", *International Journal of Emergency Management*, Vol. 3, No. 4, pp. 250-63.

- Tiryakian, E.A. (1968), "Typologies", in Sills, D.L. (Ed.), *International encyclopedia of the social sciences*, Crowell Collier and Macmillan, New York, NY, pp. 177-86.
- Tomasini, R. and Van Wassenhove, L. (2004), "A framework to unravel, prioritize and coordinate vulnerability and complexity factors affecting a humanitarian operation", INSEAD, available at: <http://www.insead.edu/facultyresearch/research/doc.cfm?did=1363> (accessed 9 November 2015).
- Tomasini, R. and Van Wassenhove, L. (2009), *Humanitarian logistics*, Palgrave Macmillan, Basingstoke.
- Trkman, P. and McCormack, K. (2009), "Supply chain risk in turbulent environments - A conceptual model for managing supply chain network risk", *International Journal of Production Economics*, Vol. 119, No. 2, pp. 247-58.
- Turner, R.H. (1989), "Taxonomy as an approach to theory development?", *International Journal of Mass Emergencies and Disasters*, Vol. 7, No. 3, pp. 265-75.
- Ullman, J.B. and Bentler, P.M. (2004), "Structural equation modeling", in Hardy, M. and Bryman, A. (Eds.), *Handbook of data analysis*, Sage, London, pp. 431-58.
- UNHCR (2007), "Handbook for emergencies", United Nations High Commissioner for Refugees, available at: <http://www.unhcr.org/472af2972.html> (accessed 9 November 2015).
- UNHCR (2015), "About us", United Nations High Commissioner for Refugees, available at: <http://www.unhcr.org/pages/49c3646c2.html> (accessed 9 November 2015).
- UNISDR (2007), "Terminology", United Nations International Strategy for Disaster Reduction, available at: <http://www.unisdr.org/we/inform/terminology> (accessed 9 November 2015).
- USAID (2015), "Syria - Complex emergency", United States Agency for International Development, available at: http://www.usaid.gov/sites/default/files/documents/1866/syria_ce_fs06_06-25-2015.pdf (accessed 9 November 2015).
- Vaillancourt, A. and Haavisto, I. (2015), "Country logistics performance and disaster impact", *Disasters*, Vol. 40, No. 2, pp. 262-83.
- Van Brabant, K. (1997), "Organisational and institutional learning in the humanitarian sector", ALNAP, available at: <http://old.alnap.org/resource/5303.aspx?tag=543> (accessed 9 November 2015).
- van der Laan, E.A., de Brito, M.P. and Vergunst, D.A. (2009), "Performance measurement in humanitarian supply chains", *International Journal of Risk Assessment and Management*, Vol. 13, No. 1, pp. 22-45.
- Van der Vorst, J.G.A.J. and Beulens, A.J.M. (2002), "Identifying sources of uncertainty to generate supply chain redesign strategies", *International Journal of Physical Distribution & Logistics Management*, Vol. 32, No. 6, pp. 409-30.
- Van Wassenhove, L.N. (2006), "Humanitarian aid logistics: supply chain management in high gear", *The Journal of the Operational Research Society*, Vol. 57, No. 5, pp. 475-89.
- Vázquez-Bustelo, D., Avella, L. and Fernández, E. (2007), "Agility drivers, enablers and outcomes", *International Journal of Operations & Production Management*, Vol. 27, No. 12, pp. 1303-32.
- Venkatesh, V.G., Dubey, R. and Sli, S.S. (2013), "Disaster relief operations and continuous aid program in human supply networks: are they congruent?", in Pant, M., Deep, K., Nagar, A. and Bansal, J.C. (Eds.), *Third International Conference on Soft Computing for Problem Solving (SocProS 2013)*, New Dehli, India, Springer, pp. 959-73.
- Vinodh, S., Devadasan, S.R., Vasudeva Reddy, B. and Ravichand, K. (2010), "Agility index measurement using multi-grade fuzzy approach integrated in a 20 criteria agile model", *International Journal of Production Research*, Vol. 48, No. 23, pp. 7159-76.
- von Bertalanffy, L. (1950), "An outline of general system theory", *The British Journal for the Philosophy of Science*, Vol. 1, No. 2, pp. 134-65.
- von Bertalanffy, L. (1968), *General system theory: foundations, development, applications*, Penguin Books, Harmondsworth.
- von Bertalanffy, L. (1972), "The history and status of general systems theory", *Academy of Management Journal*, Vol. 15, No. 4, pp. 407-26.
- von Krogh, G., Ichijo, K. and Nonaka, I. (2000), *Enabling knowledge creation*, Oxford University Press, Oxford.
- Wagner, S.M. and Neshat, N. (2010), "Assessing the vulnerability of supply chains using graph theory", *International Journal of Production Economics*, Vol. 126, No. 1, pp. 121-9.

References

- Wakolbinger, T. and Toyasaki, F. (2014), "Impacts of funding systems on humanitarian operations", in Tatham, P.H. and Christopher, M.G. (Eds.), *Humanitarian logistics*, Kogan Page, London, pp. 41-56.
- Wallenburg, C.M. and Weber, J. (2005), "Structural equation modeling as a basis for theory development within logistics and supply chain management research", in Kotzab, H., Seuring, S., Müller, M. and Reiner, G. (Eds.), *Research methodologies in supply chain management*, Physica-Verlag, Heidelberg, pp. 171-86.
- Walsh, D.P. (2010), "Complex environments", in Cox, J.F. and Schleier, J.G. (Eds.), *Theory of constraints handbook*, McGraw-Hill, New York, NY, pp. 1045-65.
- Warner, R.M. (2013), *Applied statistics: from bivariate through multivariate techniques*, Sage Publications, Thousand Oaks, CA.
- Waters, D. (2007), *Supply chain risk management: vulnerability and resilience in logistics*, Kogan Page, London.
- Weber, R.P. (1990), *Basic content analysis*, Sage Publications, Thousand Oaks, CA.
- Weick, K.E. and Sutcliffe, K.M. (2001), *Managing the unexpected*, John Wiley & Sons, San Francisco, CA.
- Weiers, R.M. (2008), *Introduction to business statistics*, Thomson South-Western, Mason, OH.
- WFP (2004a), "Full report of the thematic evaluation of the protracted relief and recovery operation (PRRO) category", World Food Programme, available at: <http://documents.wfp.org/stellent/groups/public/documents/reports/wfp065633.pdf> (accessed 9 November 2015).
- WFP (2004b), "Summary report of the thematic evaluation of the PRRO category", World Food Programme, available at: <http://documents.wfp.org/stellent/groups/public/documents/eb/wfp024420.pdf> (accessed 9 November 2015).
- WFP (2005), "Definition of emergencies", World Food Programme, available at: <http://www.wfp.org/sites/default/files/Definition%20of%20Emergencies%20-%20282005%29.pdf> (accessed 9 November 2015).
- WFP (2009a), "Closing the learning loop - Harvesting lessons from evaluations", World Food Programme, available at: <http://documents.wfp.org/stellent/groups/public/documents/reports/wfp225420.pdf> (accessed 9 November 2015).
- WFP (2009b), "Review of management and administration in the World Food Programme", World Food Programme, available at: <https://www.unjuu.org/en/reports-notes/JIU%20Products/JIU REP 2009 7 English.pdf> (accessed 9 November 2015).
- WFP (2010), "Fighting hunger worldwide", World Food Programme, available at: <http://documents.wfp.org/stellent/groups/public/documents/communications/wfp220666.pdf> (accessed 9 November 2015).
- WFP (2011), "Somalia Emergency Operation 200281", World Food Programme, available at: http://one.wfp.org/operations/current_operations/project_docs/200281.pdf (accessed 9 November 2015).
- WFP (2012a), "Mali: barges in the desert carry food to Timbuktu", World Food Programme, available at: <http://www.wfp.org/videos/mali-barges-desert-carry-food-timbuktu> (accessed 9 November 2015).
- WFP (2012b), "Protracted relief and recovery operations - Somalia 200443", World Food Programme, available at: http://one.wfp.org/operations/current_operations/project_docs/200443.pdf (accessed 9 November 2015).
- WFP (2013a), "2012 food aid flows", World Food Programme, available at: <https://www.wfp.org/content/food-aid-flows-2012-report> (accessed 9 November 2015).
- WFP (2013b), "The long journey to South Sudan", World Food Programme, available at: <http://www.wfp.org/logistics/blog/blog/steering-ethiopia-corridor> (accessed 9 November 2015).
- WFP (2013c), "Running on a full tank in Yemen", World Food Programme, available at: <https://www.wfp.org/logistics/blog/blog/running-full-tank-yemen> (accessed 9 November 2015).
- WFP (2013d), "Stories from the road", World Food Programme, available at: <http://www.wfp.org/logistics/blog/blog/stories-road> (accessed 9 November 2015).
- WFP (2013e), "WFP rehabilitates ports in Somalia, boosting efficiency and trade", World Food Programme, available at: <http://www.wfp.org/stories/wfps-special-operations-increase-efficiency-ports-somalia> (accessed 9 November 2015).
- WFP (2013f), "WFP Sudan land transport team wins international award", World Food Programme, available at: <http://www.wfp.org/logistics/blog/blog/wfp-sudan-fleet-team-wins-international-award> (accessed 9 November 2015).

- WFP (2013g), "WFP's emergency preparedness and response branch", World Food Programme, available at: <http://documents.wfp.org/stellent/groups/public/documents/resources/wfp257407.pdf> (accessed 9 November 2015).
- WFP (2014), "Creative logisticians work around bad weather in the Philippines", World Food Programme, available at: <https://www.wfp.org/logistics/blog/blog/creative-logisticians-work-around-bad-weather-philippines> (accessed 9 November 2015).
- WFP (2015a), "Development Operations (DEVs)", World Food Programme, available at: <http://www.wfp.org/operations/development> (accessed 9 November 2015).
- WFP (2015b), "Emergency Operations (EMOPs)", World Food Programme, available at: <http://www.wfp.org/operations/emergency> (accessed 9 November 2015).
- WFP (2015c), "Here's a quick way to learn about WFP's response to Cyclone Pam", World Food Programme, available at: <http://www.wfp.org/logistics/blog/heres-quick-way-learn-about-wfps-vanuatu-response-gifs> (accessed 9 November 2015).
- WFP (2015d), "Our work", World Food Programme, available at: <http://www.wfp.org/our-work> (accessed 9 November 2015).
- WFP (2015e), "Protracted relief and recovery (PRROs)", World Food Programme, available at: <http://www.wfp.org/operations/relief> (accessed 9 November 2015).
- WFP (2015f), "Special Operations (SOs)", World Food Programme, available at: <http://www.wfp.org/operations/special> (accessed 9 November 2015).
- WFP (2015g), "Surface transport", World Food Programme, available at: <http://www.wfp.org/logistics/surface-transport> (accessed 9 November 2015).
- WFP (2015h), "WFP in 2014", World Food Programme, available at: <http://www.wfp.org/content/wfp-2014> (accessed 9 November 2015).
- WFP Logistics (2013), "WFP Logistics in 2012", World Food Programme, available at: <http://documents.wfp.org/stellent/groups/public/documents/communications/wfp257680.pdf> (accessed 9 November 2015).
- WFP Logistics (2015), "WFP Logistics in 2014", World Food Programme, available at: <http://www.wfp.org/logistics/blog/how-did-wfp-logistics-rise-challenges-2014> (accessed 9 November 2015).
- Whetten, D.A. (1989), "What constitutes a theoretical contribution", *Academy of Management Review*, Vol. 14, No. 4, pp. 490-5.
- Whiting, M.C. and Ayala-Öström, B.E. (2009), "Advocacy to promote logistics in humanitarian aid", *Management Research News*, Vol. 32, No. 11, pp. 1081-9, 1081.
- Whitten, G.D., Green Jr, K.W. and Zelbst, P.J. (2012), "Triple-A supply chain performance", *International Journal of Operations & Production Management*, Vol. 32, No. 1, pp. 28-48.
- Whybark, D.C., Melnyk, S.A., Day, J.M. and Davis, E.W. (2010), "Disaster relief supply chain management: new realities, management challenges, emerging opportunities", *Decision Line*, Vol. 41, No. 3, pp. 4-7.
- Wieland, A. and Wallenburg, C.M. (2012), "Dealing with supply chain risks: linking risk management practices and strategies to performance", *International Journal of Physical Distribution & Logistics Management*, Vol. 42, No. 10, pp. 887-905.
- Wisner, B. and Gaillard, J.C. (2009), "An introduction to neglected disasters", *Jàmbá: Journal of Disaster Risk Studies*, Vol. 2, No. 3, pp. 151-8.
- Wolf, E.J., Harrington, K.M., Clark, S.L. and Miller, M.W. (2013), "Sample size requirements for structural equation models: an evaluation of power, bias, and solution propriety", *Educational & Psychological Measurement*, Vol. 73, No. 6, pp. 913-34.
- Wood, D.F., Barone, A.P., Murphy, P.R. and Wardlow, D.L. (2002), *International logistics*, Amacom, New York.
- World Economic Forum (2012), "New models for addressing supply chain and transport risk", available at: http://www3.weforum.org/docs/WEF_SCT_RRN_NewModelsAddressingSupplyChainTransportRisk_IndustryAgenda_2012.pdf (accessed 9 November 2015).
- World Economic Forum (2013), "Perspectives on a hyperconnected world - Insights from the science of complexity", available at: http://www3.weforum.org/docs/WEF_GAC_PerspectivesHyperconnectedWorld_ExecutiveSummary_2013.pdf (accessed 9 November 2015).
- Wright, D. and Meadows, D.H. (2012), *Thinking in systems: a primer*, Routledge, Hoboken, NJ.

References

- Wright, J. (2013), "Taking a broader view of supply chain resilience", *Supply Chain Management Review*, Vol. 17, No. 2, pp. 26-31.
- Yin, R.K. (2003), *Case study research: design and methods*, Sage Publications, Thousand Oaks, CA.
- Yusuf, Y.Y., Sarhadi, M. and Gunasekaran, A. (1999), "Agile manufacturing: the drivers, concepts and attributes", *International Journal of Production Economics*, Vol. 62, No. 1-2, pp. 33-43.
- Zhang, Y. and Wildemuth, B.M. (2009), "Qualitative analysis of content", in Wildemuth, B.M. (Ed.), *Applications of social research methods to questions in information and library science*, Libraries Unlimited, Westport, CT, pp. 308-19.
- Zobel, C.W. (2009), "Representing perceived tradeoffs in defining disaster resilience", *Decision Support Systems*, Vol. 50, No. 2, pp. 394-403.

APPENDICES

APPENDIX 1: WFP LETTER OF INVITATION

Fighting Hunger Worldwide



**World Food
Programme**

13 May 2014

To Whom It May Concern:

The World Food Programme (WFP) Headquarters, Rome Italy would like to invite Cecile L'Hermitte from 12th to 25th of June 2014 to do research in Logistics . She is a French national with date of birth 21 April 1973 and holder of passport no. 09AD52329 expiring on the 1st of February 2015.

During this research placement, Ms. L'Hermitte will carry out her research on strategic level capabilities and their impact on operational performance by interacting with some of our staff members and conducting interviews.

We trust that her research will be beneficial and assist us in better understanding of what makes WFP an agile organisation.

Adrian van der Knaap
Chief
Logistics & Transport Service
Logistics Division

Via Cesare Giulio Viola, 68/70, 00148 Rome, Italy Telephone: +39 06 65131 Fax: +39 06 6590632/7

APPENDIX 2: INTERVIEW QUESTIONS

Main focus	Interview topic covered	Interview questions
Agility	General questions	When people talk about agility and about making WFP a more agile organisation, what do they mean? What actions are taken at the strategic level of the organisation to support the agility of logistics operations?
	1 st strategic level capability: Being purposeful	In your opinion, is WFP an organisation with a clear purpose? Why? In your opinion, does a clear purpose lead to more responsiveness and flexibility in the field? If yes, how? If no, why?
	2 nd strategic level capability: Being action-focused	What does WFP do to ensure that field workers are able to take appropriate action on the ground?
	3 rd strategic level capability: Being collaborative	Which working relationships (internal and external) are essential for field workers to achieve responsiveness and flexibility on the ground? Why?
	4 th strategic level capability: Being learning-oriented	Are there formal mechanisms in place at WFP to capture and to share learning from past operational failures and successes? If yes, which ones? If no, why? In your opinion, does organisational learning lead to more responsiveness and flexibility in the field? If yes, how? If no, why?
Protracted operations	General operational environment	How stable/turbulent is the operational environment of protracted operations?
	Nature of disruptions/constraints	What kind of disruptions/constraints do you encounter (have you encountered) in protracted operations? What is the degree of predictability of these disruptions/constraints?
	Impact on logistics operations	What is the impact of these disruptions/constraints on logistics operations?
	Dealing with disruptions/constraints	How are disruptions/constraints overcome in protracted operations? To what extent is agility (responsiveness and flexibility) needed in protracted operations?

APPENDIX 3: SURVEY QUESTIONNAIRES

- Appendix 3a: WFP (p. 241)
- Appendix 3b: agency-neutral (p. 255)



AMC IS A SPECIALIST INSTITUTE OF THE UNIVERSITY OF TASMANIA

BUILDING AGILE CAPABILITIES TO IMPROVE OPERATIONAL PERFORMANCE IN HUMANITARIAN LOGISTICS

This survey is part of a PhD project focusing on the **concept of agility** in a humanitarian context. The research aims to investigate the extent to which:

1. Agility requires strategic inputs
2. Agility positively impacts on operational performance
3. Agility is needed not only in emergencies, but also in protracted operations.

This survey has been approved by the Tasmanian Social Science Human Research Ethics Committee (HREC). The ethics reference number is H0014077.

No details will be collected which can be used to identify you personally. All individual responses collected through this survey will be kept **strictly confidential**. They will only be used for research purposes and reported in a statistical form.

The survey will take **approximately 15 minutes** of your time to complete. If a question does not apply to you, please tick N/A (Not Applicable).

This questionnaire contains 4 sections from A to D. Please **do not use the browser's back button** as this may eject you from the survey and delete your responses.

If you have any question, please do not hesitate to contact Cécile L'Hermitte (cecile.lhermitte@utas.edu.au).

Please tick the box below and continue with the survey.

☐ I agree

A. Profile and experience

The first section of the questionnaire contains general questions about you.

A.1. Please indicate where you are working.

- ☐ Sub-office
- ☐ Area office
- ☐ Country office
- ☐ Regional bureau
- ☐ Global Headquarters in Rome
- ☐ Other, please specify _____

A.2. Please indicate your grade level.

- ☐ A
- ☐ B
- ☐ C
- ☐ D
- ☐ E
- ☐ Junior Consultant
- ☐ Level I
- ☐ Level II
- ☐ Level III
- ☐ Level IV
- ☐ P1
- ☐ P2
- ☐ P3
- ☐ P4
- ☐ P5
- ☐ D1
- ☐ D2
- ☐ ASG
- ☐ Other, please specify _____

A.3. How long have you worked for WFP?

- ☐ Up to 1 year
- ☐ 1-2 years
- ☐ 3-5 years
- ☐ 6-10 years
- ☐ Over 10 years

B. Agile capabilities

This section focuses on the 4 strategic dimensions of agility. Agility is defined as *the capacity of an organisation to support and carry out swift adjustments in response to operational contingencies along the supply chain.*

B.1. Being purposeful

Being purposeful means maintaining a clear direction for action.

To what extent do you agree or disagree with the following statements?

	Strongly agree 5	Agree 4	Neither agree nor disagree 3	Disagree 2	Strongly disagree 1	N/A 0
B.1.1. WFP has a clear purpose	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
B.1.2. WFP enhances its consistency of purpose by aligning goals and objectives across all levels of the organisation	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
B.1.3. WFP's processes and procedures are set up to achieve the organisation's purpose	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
B.1.4. I fully identify with WFP's purpose	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
B.1.5. My actions are guided by WFP's purpose	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
B.1.6. My team/group clearly understands what has to be done to fulfil the organisation's purpose	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
B.1.7. Partners across the supply chain share a sense of common purpose	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0

B.2. Being collaborative

Being collaborative means maintaining relationships in order to solve problems collaboratively.

To what extent do you agree or disagree with the following statements?

	Strongly agree 5	Agree 4	Neither agree nor disagree 3	Disagree 2	Strongly disagree 1	N/A 0
B.2.1. I maintain positive and active relationships with others <u>within</u> WFP	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
B.2.2. I maintain positive and active relationships with people <u>outside</u> WFP	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
B.2.3. My team/group is fully aware of the expertise of other units/divisions within WFP	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
B.2.4. My team/group actively collaborates with other units/divisions <u>within</u> WFP to solve problems	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
B.2.5. My team/group actively collaborates with others <u>outside</u> WFP to solve problems	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
B.2.6. WFP has mechanisms in place to support trust and coordination between the different units/divisions of the organisation	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
B.2.7. WFP eliminates functional silos by supporting the integration of the different parts of the organisation	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
B.2.8. Partners across the supply chain have a clear understanding of the role and competencies of the different parties with which they are working	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
B.2.9. Partners across the supply chain work together to solve problems	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0

B.3. Being learning-oriented

Being learning-oriented means critically evaluating past experiences and sharing the lessons learned in order to improve practices.

To what extent do you agree or disagree with the following statements?

		Strongly agree 5	Agree 4	Neither agree nor disagree 3	Disagree 2	Strongly disagree 1	N/A 0
B.3.1.	I am committed to active learning and self-development	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
B.3.2.	I generate new insights and share information with others in the team/group	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
B.3.3.	My team/group continuously learns from communicating with other units/divisions	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
B.3.4.	My team/group reflects on past experiences and generates its own procedures based on best practices	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
B.3.5.	WFP has mechanisms in place for identifying lessons from past operational successes and failures	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
B.3.6.	WFP translates the lessons from past experiences into improved and more relevant processes and practices	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
B.3.7.	WFP shares best practices throughout the organisation and across operations	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
B.3.8.	Partners across the supply chain learn from each other	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
B.3.9.	Partners jointly evaluate their performance in order to improve their future work	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0

B.4. Being action-focused

The last strategic dimension of agility, being action-focused, means building readiness to appropriately manage risks and opportunities.

To what extent do you agree or disagree with the following statements?

		Strongly agree 5	Agree 4	Neither agree nor disagree 3	Disagree 2	Strongly disagree 1	N/A 0
B.4.1.	I have the skills needed to meet the requirements of my position	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
B.4.2.	I feel confident in my ability to take the initiative as necessary	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
B.4.3.	My team/group has the necessary resources	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
B.4.4.	My team/group is provided with suitable processes and procedures for dealing with common situations	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
B.4.5.	My team/group is authorised to adapt processes and procedures when necessary	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
B.4.6.	WFP has an extensive field presence	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
B.4.7.	WFP has short and rapid decision-making lines and approval protocols	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
B.4.8.	WFP delegates authority and responsibilities to support action	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
B.4.9.	WFP has effective leaders in place who drive action	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0

B.4.10.	WFP makes accurate <u>logistics</u> information available (e.g. track-and-trace information, availability of resources, etc.)	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
B.4.11.	WFP disseminates <u>risk-related</u> information to assist decision-making in uncertain situations (e.g. political or weather risks)	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
B.4.12.	WFP disseminates <u>demand-related</u> information (e.g. what is needed, in which quantities, when, where) in a timely manner	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
B.4.13.	WFP provides the right information to the right people at the right time	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
B.4.14.	Partners across the supply chain actively engage in information sharing (e.g. logistics data, predictive analysis, etc.)	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
B.4.15.	Partners across the supply chain develop consistent policies and procedures to support their action	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0

C. Operational performance

This section focuses on 4 aspects of operational performance: responsiveness, flexibility, effectiveness, and efficiency.

C.1. How do you perceive WFP's overall field responsiveness as reflected by the 3 following elements?

		Very good 5	Good 4	Neutral 3	Poor 2	Very poor 1	N/A 0
C.1.1.	Ability to identify local risks and opportunities along the supply chain	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
C.1.2.	Ability to quickly respond to operational risks and opportunities	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
C.1.3.	Ability to make fast decisions	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0

C.2. Based on your past experience, which of the following factors contribute the most to the building of responsiveness (i.e. the ability to quickly manage risks and opportunities along the supply chain)?

Please tick the **3 FACTORS** that you consider the most important.

- ☐ A clear organisational purpose
- ☐ Skilled and confident staff
- ☐ Effective leadership
- ☐ Clear processes and procedures
- ☐ Short and rapid decision making lines
- ☐ Delegated authority
- ☐ Adequate resources
- ☐ The right information to the right people at the right time
- ☐ Extensive field presence
- ☐ Collaborative relationships
- ☐ Integration of the different parts of the organisation (i.e. eliminating silos)
- ☐ Learning from past experiences
- ☐ Sharing best practices across operations

C.3. How do you perceive WFP's overall field flexibility as reflected by the 3 following elements?

		Very good 5	Good 4	Neutral 3	Poor 2	Very poor 1	N/A 0
C.3.1.	The ability to reconfigure transport operations (e.g. to change transport modes or routes)	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
C.3.2.	The ability to adapt the delivery terms (e.g. range of products, volume, place, date, frequency)	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
C.3.3.	The ability to adjust the network of partners (e.g. suppliers of logistics services, military, etc.)	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0

C.4. Based on your past experience, which of the following factors contribute the most to the building of flexibility (i.e. the ability to adapt operations)?

*Please tick the **3 FACTORS** that you consider the most important.*

- ☐ A clear organisational purpose
- ☐ Skilled and confident staff
- ☐ Effective leadership
- ☐ Clear processes and procedures
- ☐ Short and rapid decision making lines
- ☐ Delegated authority
- ☐ Adequate resources
- ☐ The right information to the right people at the right time
- ☐ Extensive field presence
- ☐ Collaborative relationships
- ☐ Integration of the different parts of the organisation (i.e. eliminating silos)
- ☐ Learning from past experiences
- ☐ Sharing best practices across operations

C.5. How do you perceive WFP's overall field effectiveness as reflected by the 4 following elements?

	Very good 5	Good 4	Neutral 3	Poor 2	Very poor 1	N/A 0
C.5.1. Ability to deliver the right supplies	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
C.5.2. Ability to deliver the supplies in the requested quantities	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
C.5.3. Ability to deliver the supplies at the requested time	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
C.5.4. Ability to deliver the supplies to the requested place	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0

C.6. How do you perceive WFP's overall field efficiency as reflected by the 3 following elements?

	Very good 5	Good 4	Neutral 3	Poor 2	Very poor 1	N/A 0
C.6.1. Ability to minimise logistics costs	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
C.6.2. Ability to minimise the value of held inventory	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
C.6.3. Ability to minimise cargo losses (due to spoilage, obsolescence, pilferage, etc.)	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0

D. The operational environment of PRROs

The last part of the questionnaire focuses on Protracted Relief and Recovery Operations (PRROs) because there is relatively little academic research on this category of operations.

Are you working or have you previously worked in the field in a PRRO?

☐ Yes

☐ No (online survey logic => Thank you page)

D.1. To what extent do you agree or disagree with the following statements regarding PRROs?

	Strongly agree 5	Agree 4	Neither agree nor disagree 3	Disagree 2	Strongly disagree 1	N/A 0
D.1.1. Demand patterns are stable	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
D.1.2. Delivery lead times are regular	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
D.1.3. The network of supply chain participants (suppliers, implementing partners, etc.) is well established	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
D.1.4. Timely and accurate logistics information is available (e.g. inventory levels, physical position of the goods, etc.)	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
D.1.5. Supply chains are demand-driven (i.e. supplies are pulled through the supply chain)	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
D.1.6. Order fulfilment processes are well established	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0

D.2. Based on your past experience, which of the following contextual disruptions/constraints are the most frequent in PRROs?

*Please tick the **3 MOST FREQUENT** contextual disruptions/constraints.*

- ☐ Physical (e.g. weather, typography, etc.)
- ☐ Security (e.g. conflict, pilferage, etc.)
- ☐ Infrastructure (e.g. roads, ports, communication, etc.)
- ☐ Socio-economic (e.g. logistics resources, skills, fuel prices, etc.)
- ☐ Government (e.g. inefficient administration, corrupt practices, etc.)
- ☐ Other, please specify _____

D.3. Based on your past experience, which of the following supply chain-related factors are the most constraining/disruptive in PRROs?

*Please tick the **3 MOST FREQUENT** supply chain-related sources of constraints/disruptions.*

- ☐ WFP's business processes and standard procedures
- ☐ Functional silos within WFP
- ☐ Funding and in-kind donations
- ☐ Demand for humanitarian supplies
- ☐ Suppliers of food and other items
- ☐ Suppliers of logistics services
- ☐ Implementing partners
- ☐ Commercial partners (e.g. TNT, UPS, Maersk, etc.)
- ☐ Other, please specify _____

D.4. Do contextual and supply chain disruptions/constraints have the following impacts on logistics activities in PRROs?

	All the time 5	Frequentl y 4	Sometim es 3	Seldom 2	Never 1	N/A 0
D.4.1. Access restrictions	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
D.4.2. Operational bottlenecks	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
D.4.3. Capacity constraints (warehousing and/or transport)	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
D.4.4. Delayed deliveries	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
D.4.5. Stock-outs	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
D.4.6. Partial or total loss of cargo (e.g. pilferage)	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
D.4.7. Supplies not fit for purpose (e.g. damaged, deteriorated, close to or beyond expiry date)	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
D.4.8. Cost increases beyond anticipated budget	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
D.4.9. Skill shortages	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
D.4.10. Other, please specify _____	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0

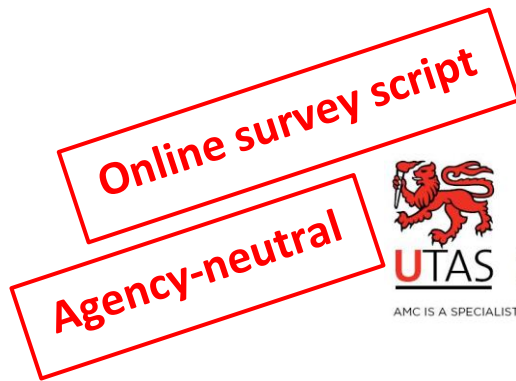
D.5. How are operational disruptions/constraints mitigated/overcome?

	All the time 5	Frequentl y 4	Sometim es 3	Seldom 2	Never 1	N/A 0
D.5.1. By adapting field operations (e.g. changing delivery locations, transport modes, transport routes, etc.)	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
D.5.2. By deviating from the agreed internal business processes and standard procedures	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
D.5.3. By securing support from the regional bureaux	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
D.5.4. By requiring support from other teams/groups within WFP Logistics (e.g. stand-by partners, shipping, etc.)	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
D.5.5. By requesting support from other divisions within WFP (e.g. information technology, procurement, etc.)	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
D.5.6. By cooperating with other organisations (humanitarian, governmental, commercial, and/or military)	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
D.5.7. Other, please specify _____ _____	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0

Concluding remarks

If you wish, please feel free to write any comments you feel may be relevant to this study.

This is the end of this survey. Many thanks for your time and for contributing to gaining a more informed understanding of the concept of agility.



BUILDING AGILE CAPABILITIES TO IMPROVE OPERATIONAL PERFORMANCE IN HUMANITARIAN LOGISTICS

This survey is part of a PhD project focusing on the **concept of agility** in a humanitarian context. The research aims to investigate the extent to which:

1. Agility requires strategic inputs
2. Agility positively impacts on operational performance

This survey has been approved by the Tasmanian Social Science Human Research Ethics Committee (HREC). The ethics reference number is H0014077.

No details will be collected which can be used to identify you personally. All individual responses collected through this survey will be kept **strictly confidential**. They will only be used for research purposes and reported in a statistical form.

This questionnaire contains 3 sections from A to C. It will take **approximately 15 minutes** of your time to complete. If a question does not apply to you, please tick N/A (Not Applicable).

If you have any question, please do not hesitate to contact Cécile L'Hermitte (cecile.lhermitte@utas.edu.au).

Please tick the box below and continue with the survey.

☐ I agree

A. Profile and experience

The first section of the questionnaire contains general questions about you.

A.1. Please indicate where you are working.

- ☐ Sub-office
- ☐ Area office
- ☐ Country office
- ☐ Regional bureau
- ☐ Global Headquarters in Rome
- ☐ Other, please specify _____

A.2. At which organisational level are you working?

- ☐ Operations
- ☐ Front-line management
- ☐ Middle management
- ☐ Senior management
- ☐ Other, please specify _____

A.3. For which organisation are you working?

A.4. How long have you worked for WFP?

- ☐ Up to 1 year
- ☐ 1-2 years
- ☐ 3-5 years
- ☐ 6-10 years
- ☐ Over 10 years

B. Agile capabilities

This section focuses on the 4 strategic dimensions of agility. Agility is defined as *the capacity of an organisation to support and carry out swift adjustments in response to operational contingencies along the supply chain.*

B.1. Being purposeful

Being purposeful means maintaining a clear direction for action.

To what extent do you agree or disagree with the following statements?

		Strongly agree 5	Agree 4	Neither agree nor disagree 3	Disagree 2	Strongly disagree 1	N/A 0
B.1.1.	My organisation has a clear purpose	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
B.1.2.	My organisation enhances its consistency of purpose by aligning goals and objectives across all levels	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
B.1.3.	My organisation's processes and procedures are set up to achieve the overall purpose	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
B.1.4.	I fully identify with my organisation's purpose	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
B.1.5.	My actions are guided by my organisation's purpose	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
B.1.6.	My team/group clearly understands what has to be done to fulfil the organisation's purpose	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
B.1.7.	Partners across the supply chain share a sense of common purpose	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0

B.2. Being collaborative

Being collaborative means maintaining relationships in order to solve problems collaboratively.

To what extent do you agree or disagree with the following statements?

	Strongly agree 5	Agree 4	Neither agree nor disagree 3	Disagree 2	Strongly disagree 1	N/A 0
B.2.1. I maintain positive and active relationships with others <u>within</u> the organisation	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
B.2.2. I maintain positive and active relationships with people <u>outside</u> the organisation	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
B.2.3. My team/group is fully aware of the expertise of other units/divisions within the organisation	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
B.2.4. My team/group actively collaborates with other units/divisions <u>within</u> the organisation to solve problems	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
B.2.5. My team/group actively collaborates with others <u>outside</u> the organisation to solve problems	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
B.2.6. My organisation has mechanisms in place to support trust and coordination between the different units/divisions	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
B.2.7. My organisation eliminates functional silos by supporting the integration of the different parts of the organisation	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
B.2.8. Partners across the supply chain have a clear understanding of the role and competencies of the different parties with which they are working	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
B.2.9. Partners across the supply chain work together to solve problems	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0

B.3. Being learning-oriented

Being learning-oriented means critically evaluating past experiences and sharing the lessons learned in order to improve practices.

To what extent do you agree or disagree with the following statements?

		Strongly agree 5	Agree 4	Neither agree nor disagree 3	Disagree 2	Strongly disagree 1	N/A 0
B.3.1.	I am committed to active learning and self-development	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
B.3.2.	I generate new insights and share information with others in the team/group	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
B.3.3.	My team/group continuously learns from communicating with other units/divisions	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
B.3.4.	My team/group reflects on past experiences and generates its own procedures based on best practices	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
B.3.5.	My organisation has mechanisms in place for identifying lessons from past operational successes and failures	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
B.3.6.	My organisation translates the lessons from past experiences into improved and more relevant processes and practices	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
B.3.7.	My organisation shares best practices throughout the organisation and across operations	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
B.3.8.	Partners across the supply chain learn from each other	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
B.3.9.	Partners jointly evaluate their performance in order to improve their future work	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0

B.4. Being action-focused

The last strategic dimension of agility, being action-focused, means building readiness to appropriately manage risks and opportunities.

To what extent do you agree or disagree with the following statements?

		Strongly agree 5	Agree 4	Neither agree nor disagree 3	Disagree 2	Strongly disagree 1	N/A 0
B.4.1.	I have the skills needed to meet the requirements of my position	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
B.4.2.	I feel confident in my ability to take the initiative as necessary	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
B.4.3.	My team/group has the necessary resources	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
B.4.4.	My team/group is provided with suitable processes and procedures for dealing with common situations	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
B.4.5.	My team/group is authorised to adapt processes and procedures when necessary	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
B.4.6.	My organisation has an extensive field presence (including offices in remote areas)	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
B.4.7.	My organisation has short and rapid decision-making lines and approval protocols	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
B.4.8.	My organisation delegates authority and responsibilities to support action	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
B.4.9.	My organisation has effective leaders in place who drive action	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0

B.4.10.	My organisation makes accurate <u>logistics</u> information available (e.g. track-and-trace information, availability of resources, etc.)	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
B.4.11.	My organisation disseminates <u>risk-related</u> information to assist decision-making in uncertain situations (e.g. political or weather risks)	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
B.4.12.	My organisation disseminates <u>demand-related</u> information (e.g. what is needed, in which quantities, when, where) in a timely manner	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
B.4.13.	My organisation provides the right information to the right people at the right time	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
B.4.14.	Partners across the supply chain actively engage in information sharing (e.g. logistics data, predictive analysis, etc.)	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
B.4.15.	Partners across the supply chain develop consistent policies and procedures to support their action	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0

C. Operational performance

This last section focuses on 4 aspects of operational performance: responsiveness, flexibility, effectiveness, and efficiency.

C.1. How do you perceive your organisation's overall field responsiveness as reflected by the 3 following elements?

		Very good 5	Good 4	Neutral 3	Poor 2	Very poor 1	N/A 0
C.1.1.	Ability to identify local risks and opportunities along the supply chain	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
C.1.2.	Ability to quickly respond to operational risks and opportunities	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
C.1.3.	Ability to make fast decisions	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0

C.2. Based on your past experience, which of the following factors contribute the most to the building of responsiveness (i.e. the ability to quickly manage risks and opportunities along the supply chain)?

Please tick the **3 FACTORS** that you consider the most important.

- ☐ A clear organisational purpose
- ☐ Skilled and confident staff
- ☐ Effective leadership
- ☐ Clear processes and procedures
- ☐ Short and rapid decision making lines
- ☐ Delegated authority
- ☐ Adequate resources
- ☐ The right information to the right people at the right time
- ☐ Extensive field presence
- ☐ Collaborative relationships
- ☐ Integration of the different parts of the organisation (i.e. eliminating silos)
- ☐ Learning from past experiences
- ☐ Sharing best practices across operations

C.3. How do you perceive your organisation's overall field flexibility as reflected by the 3 following elements?

	Very good 5	Good 4	Neutral 3	Poor 2	Very poor 1	N/A 0
C.3.1. The ability to reconfigure transport operations (e.g. to change transport modes or routes)	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
C.3.2. The ability to adapt the delivery terms (e.g. range of products, volume, place, date, frequency)	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
C.3.3. The ability to adjust the network of partners (e.g. suppliers of logistics services, military, etc.)	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0

C.4. Based on your past experience, which of the following factors contribute the most to the building of flexibility (i.e. the ability to adapt operations)?

Please tick the **3 FACTORS** that you consider the most important.

- ☐ A clear organisational purpose
- ☐ Skilled and confident staff
- ☐ Effective leadership
- ☐ Clear processes and procedures
- ☐ Short and rapid decision making lines
- ☐ Delegated authority
- ☐ Adequate resources
- ☐ The right information to the right people at the right time
- ☐ Extensive field presence
- ☐ Collaborative relationships
- ☐ Integration of the different parts of the organisation (i.e. eliminating silos)
- ☐ Learning from past experiences
- ☐ Sharing best practices across operations

C.5. How do you perceive your organisation's overall field effectiveness as reflected by the 4 following elements?

	Very good 5	Good 4	Neutral 3	Poor 2	Very poor 1	N/A 0
C.5.1. Ability to deliver the right supplies	<input type="checkbox"/> ₅	<input type="checkbox"/> ₄	<input type="checkbox"/> ₃	<input type="checkbox"/> ₂	<input type="checkbox"/> ₁	<input type="checkbox"/> ₀
C.5.2. Ability to deliver the supplies in the requested quantities	<input type="checkbox"/> ₅	<input type="checkbox"/> ₄	<input type="checkbox"/> ₃	<input type="checkbox"/> ₂	<input type="checkbox"/> ₁	<input type="checkbox"/> ₀
C.5.3. Ability to deliver the supplies at the requested time	<input type="checkbox"/> ₅	<input type="checkbox"/> ₄	<input type="checkbox"/> ₃	<input type="checkbox"/> ₂	<input type="checkbox"/> ₁	<input type="checkbox"/> ₀
C.5.4. Ability to deliver the supplies to the requested place	<input type="checkbox"/> ₅	<input type="checkbox"/> ₄	<input type="checkbox"/> ₃	<input type="checkbox"/> ₂	<input type="checkbox"/> ₁	<input type="checkbox"/> ₀

C.6. How do you perceive your organisation's overall field efficiency as reflected by the 3 following elements?

	Very good 5	Good 4	Neutral 3	Poor 2	Very poor 1	N/A 0
C.6.1. Ability to minimise logistics costs	<input type="checkbox"/> ₅	<input type="checkbox"/> ₄	<input type="checkbox"/> ₃	<input type="checkbox"/> ₂	<input type="checkbox"/> ₁	<input type="checkbox"/> ₀
C.6.2. Ability to minimise the value of held inventory	<input type="checkbox"/> ₅	<input type="checkbox"/> ₄	<input type="checkbox"/> ₃	<input type="checkbox"/> ₂	<input type="checkbox"/> ₁	<input type="checkbox"/> ₀
C.6.3. Ability to minimise cargo losses (due to spoilage, obsolescence, pilferage, etc.)	<input type="checkbox"/> ₅	<input type="checkbox"/> ₄	<input type="checkbox"/> ₃	<input type="checkbox"/> ₂	<input type="checkbox"/> ₁	<input type="checkbox"/> ₀

Concluding remarks

If you wish, please feel free to write any comments you feel may be relevant to this study.

This is the end of this survey. Many thanks for your time and for contributing to gaining a more informed understanding of the concept of agility.

APPENDIX 4: LEADERSHIP DECISION MAKING AREAS

Strategic level agility capability	Agility factors
Being purposeful	The organisation has a clear purpose
	The organisation enhances its consistency of purpose by aligning goals and objectives across all levels
	The organisation's processes and procedures are set up to achieve the overall purpose
	Individuals fully identify with the organisation's purpose
	Individuals' actions are guided by the organisation's purpose
	Teams/groups clearly understand what has to be done to fulfil the organisation's purpose
	Partners across the supply chain share a sense of common purpose
Being action- focused	Individuals have the skills needed to meet the requirements of their positions
	Individuals feel confident in their ability to take the initiative as necessary
	Teams/groups have the necessary resources
	Teams/groups are provided with suitable processes and procedures for dealing with common situations
	Teams/groups are authorised to adapt processes and procedures when necessary
	The organisation has an extensive field presence (including offices in remote areas)
	The organisation has short and rapid decision-making lines and approval protocols
	The organisation delegates authority and responsibilities to support action
	The organisation has effective leaders in place who drive action
	The organisation makes accurate <u>logistics</u> information available (e.g. track-and-trace information, availability of resources, etc.)
	The organisation disseminates <u>risk-related</u> information to assist decision-making in uncertain situations (e.g. political or weather risks)
	The organisation disseminates <u>demand-related</u> information (e.g. what is needed, in which quantities, when, where) in a timely manner
	The organisation provides the right information to the right people at the right time
Being collaborative	Partners across the supply chain actively engage in information sharing (e.g. logistics data, predictive analysis, etc.)
	Partners across the supply chain develop consistent policies and procedures to support their action
	Individuals maintain positive and active relationships with others <u>within</u> the organisation
	Individuals maintain positive and active relationships with people <u>outside</u> the organisation
	Teams/groups are fully aware of the expertise of other units/divisions within the organisation
	Teams/groups actively collaborate with other units/divisions <u>within</u> the organisation to solve problems
	Teams/groups actively collaborate with others <u>outside</u> the organisation to solve problems
	The organisation has mechanisms in place to support trust and coordination between the different units/divisions
	The organisation eliminates functional silos by supporting the integration of the different parts of the organisation
	Partners across the supply chain have a clear understanding of the role and competencies of the different parties with which they are working
Being learning- oriented	Partners across the supply chain work together to solve problems
	Individuals are committed to active learning and self-development
	Individuals generate new insights and share information with others in the team/group
	Teams/groups continuously learn from communicating with other units/divisions
	Teams/groups reflect on past experiences and generate their own procedures based on best practices
	The organisation has mechanisms in place for identifying lessons from past operational successes and failures
	The organisation translates the lessons from past experiences into improved and more relevant processes and practices
	The organisation shares best practices throughout the organisation and across operations
	Partners across the supply chain learn from each other
	Partners jointly evaluate their performance in order to improve their future work