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TOWARDS A HUMANITARIAN LOGISTICS KNOWLEDGE MANAGEMENT SYSTEM

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Paper Classification

Conceptual Paper

Abstract

Purpose

The aim of this paper is to offer a conceptual model and an associated taxonomy to support the development of a body of knowledge in support of the logistic response to a natural or man-made disaster.

Design/Methodology/Approach

Based on a literature review, the paper outlines the difficulties associated with the logistic response to a disaster, before discussing a generic approach to knowledge management. The literature review is then used to identify two potential models (the Supply-Chain Operations Reference (SCOR) and the UK Defence Lines of Development (LOD)) that are then further developed and integrated in order to underpin a knowledge taxonomy.

Findings

The paper proposes a model that combines both the SCOR and LOD models into a unified approach as a first step towards the development of a broad ranging reference source to support humanitarian logisticians and, thereby, improve the effectiveness and efficiency of the response to future disasters.

Research Limitations

As a first step towards the creation of a knowledge taxonomy, this conceptual paper, does not attempt to validate the model, but it proposes an approach by which this could be undertaken.

Practical Implications

Given the plethora of non-governmental organisations (NGOs) in the broadest sense of this categorisation, and also recognising the varied nature of their aims, objectives and approaches, the paper pays particular attention to the need to develop a model that can be supported by the NGO community as a whole.

Key Words

Humanitarian logistics, Knowledge management, Knowledge taxonomy, Supply network management, Supply chain management.

TOWARDS A HUMANITARIAN LOGISTICS KNOWLEDGE MANAGEMENT SYSTEM

"While information always comes at a cost, the price of poor information – or none – is higher"[1]

Introduction

In the aftermath of a disaster, be it natural or manmade, the delivery of logistics is a cornerstone of the response of the humanitarian community. In fact, researchers have suggested that as much as 80% of the expenditure of non-government organizations (NGOs) can be classified under the broad heading of logistics (van Wassenhove, 2006) and that, thereby, an NGO can be seen to be a logistic organization – albeit one with, typically, a specific mandate and target set of beneficiaries.

Although there are clear differences between commercial and humanitarian logistics – not least in that, in the case of the latter, inefficiency in the response can be counted in terms of loss of life rather than, simply, reduced profits (Tatham and Kovács, 2007) – humanitarian logistics can be seen as a subset of the general concept of logistics. In line with this perspective, the term "logistics" within this paper reflects the following definition which has been drawn from two of the key commentators in the field:

> "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)

It can be argued that this definition falls closer to that of supply chain (or network) management rather than logistics, but in reality (as explained by Larson & Halldórsson, 2004), an agreed definition of both these concepts still remains elusive. Thus, supply chain management, as viewed by the Council of Supply Chain Management Professionals (CSCMP), encompasses the planning and management activities involved in sourcing and procurement, conversion, and all logistics management activities. As such it is clearly very similar to the definition that we propose to use – however, the humanitarian community as a whole tends to prefer the label "logistics" for such activities and we have elected, therefore, to follow this approach. However, in doing so, we fully recognize the existence of alternate definitions.

We also wish to draw particular attention to the final clause of the definition which emphasizes the overall aim of a post-disaster response – that of meeting the end beneficiary's requirements. Although simply stated, this implies considerable deviation from the customer driven commercial logistic model, not

[1] Maxwell and Watkins (2003)

least as those affected by a disaster may not be in a position to understand or articulate their requirements. The NGOs community must frequently, therefore, operate not only as the deliverers of goods and services, but also through the provision of a broader range of planning and managerial activities.

Achievement of these closely intertwined functions is a particular challenge in the pressured environment of disaster response but is made even more so by the need to achieve inter- and intra-organizational coordination. The presence of many dedicated individuals and groups who are focused on support of those affected by the disaster leads to a degree of inefficiency through overlap, friction and, inevitably, confusion.

This situation is exacerbated by the cyclical nature of disaster prevention, immediate response and post disaster recovery and rehabilitation (Safran, 2005) within which funding is typically provided after a disaster, but relatively little in the prevention phase (Thomas and Fritz, 2005). As a result, whilst there is a significant influx of support to the affected population, it is frequently delivered on an unplanned basis leading to the situation that:

> "...while logisticians have a remarkable track record for getting the job done under the most adverse and extreme circumstances, the lessons learned from one disaster to the next are often lost." (Thomas, 2003)

With this in mind, in proposing actions to improve the management and operation of a humanitarian logistic response, it would seem sensible to consider those areas which, in business life, have been the focus of research and subsequent change. One such area relates to the management of the information associated with a supply network which, nowadays, is almost taken for granted. Nevertheless, it is important to recognize that until relatively recently this was not the case and, as Harrison & van Hoek (2005) point out, if an organization is to make effective supply chain decisions, it needs to ensure that there is an accurate, timely flow of information across the supply chain as a whole. Chen & Pauldraj (2004) underline this stating that:

> "More than ever before, today's information technology is permeating the supply chain at every point, transforming the way exchange-related activities are performed and the nature of the linkages between them."

Thus, the sharing of information via information technology and the consequential development of knowledge is, arguably, the key aspect that has revolutionized supply chains in areas of commerce such as the fast moving consumer goods sector over the latter part of the 20th and early 21st centuries (Sahin and Robinson, 2002; Lewis and Talalayevsky, 2004; Day *et al*, 2007). For example, Sanders & Premus (2002) suggest that information is the "glue" that holds together the business structures that allow supply chains to be agile in responding to competitive challenges. Whilst in a recent article, Ketikidis *et al* state that the benefits that top the list from companies´ experience in using IT solutions are: better quality and quantity of information, increased flexibility,

reduced lead time and cost savings (2008). In addition, Fawcett *et al* (2008) suggest that

> "if SC [Supply Chain] managers are expected to make difficult decisions in dynamic environments, valuable information should be available at the right place, at the right time, and in the right hands of people who view the problems from different perspectives and with different styles".

Unfortunately, as outlined above, the management of information in the humanitarian context is no simple task – not least due to the plethora of "players". For example, it has been estimated that the West is home to 3-4,000 internationally operating NGOs (HPG, 2003), and even a relatively small country such as Nicaragua has as many as 350 different NGOs (2001). In addition, in any given disaster many NGOs from across the globe are involved in the provision of support or assistance as evidenced by the presence of over 100 such organizations within two weeks of the 2005 Pakistan earthquake (IFRC, 2005), or the 72 inter-NGO coordination meetings that took place weekly in Banda Aceh in the aftermath of the 2004 Asian tsunami (Völz, 2005). The presence of a large number of international organizations is, however, only part of the problem. The field force of such organizations is frequently composed of individuals who have come together to support the disaster relief work and who may never have met before or even worked for the particular NGO. With the annual movement of staff as high as 80% (Thomas and Mizushima, 2005), the information management problem does not simply reflect the volume that needs to be digested, but also that:

> "High staff turnover hampered the ability of international agencies to build institutional memory, in terms of both contextual knowledge and relationships." (Telford and Cosgrove, 2007)

In effect, as Smith & Dowell (2000) note, disaster-driven supply networks form a "temporary configuration of otherwise disparate resources". Various perspectives on the challenges of the development and operation of such networks have been offered by Denning (2006) with his concept of "hastily formed networks" (HFNs), Weick (1976) who has discussed "loosely coupled systems" and Meyerson *et al* (1996) who have developed the concept of "swift trust". All these models underline the importance of readily accessible knowledge as a means of achieving a common understanding, or shared mental model, of the particular challenge that the network seeks to resolve. It is argued that this challenge, in turn, would be significantly eased through the development of a pan-NGO Humanitarian Logistic Knowledge Management System (HLKMS).

From a logistic perspective, Christopher (2005) suggests that achieving success in the management of internal and external relationships is key to the effective and efficient operation of a supply chain - but, as discussed earlier, the sheer numbers of people involved with their associated linguistic and cultural divides, places significant demands on those working in this complex field. Add to this

the other actors in the supply chain such as donors, logistic providers, national and international governments and military forces (Kovács and Spens, 2007), and the wealth of data that is generated is massive. As an example, in the 2005 Pakistan Earthquake, in addition to the 100+ UN agencies and non-governmental organizations who arrived in the immediate aftermath of the disaster, the Pakistan government deployed 50,000 personnel and these were supported by over 100 helicopters (many from outside the country), as well as the largest peacetime deployment of NATO personnel who provided an "air bridge" of relief supplies together with many engineer and logisticians who helped to restore basic services such as water and electricity Tatham and Kovác s, 2007).

Yet such data will undoubtedly contain a vast quantity of information that has the potential to improve the performance of humanitarian supply chains and, hence, the efficiency and effectiveness of the humanitarian response. Furthermore, the difficulty in developing an appropriate managerial framework is not due to a lack of recognition of its desirability. For example as long ago as 1995, in one of the first academic papers on the subject, Long & Wood (1995) suggested that the effectiveness of the information system is a key determinant of success of a humanitarian logistic supply chain, and this view has been echoed by many other researchers including Zhang *et al* (2002), Maxwell and Watkins (2003), and Maiers *et al* (2005). Rather, the environment in which humanitarian activity takes place is intrinsically complex and, when compared with its commercial counterpart, has a number of additional hurdles that must be surmounted, including:

- The physical difficulty of reaching the beneficiaries in the face of a severely degraded transport infrastructure. As an example, 9 days after the 2005 Pakistan earthquake struck, the International Federation of Red Cross and Red Crescent Societies (IFRC) reported that 14 villages with a population of around 15,000 people had received no aid or assistance (IFRC, 2005a).

- Achieving a timely and comprehensive picture of what is required by those affected by the disaster (the "Needs Assessment" process). Thus, notwithstanding the geographic and geopolitical factors related to the 2004 SE Asia tsunami, an evaluation of the Needs Assessment process noted that many of the shortcomings had occurred in the past. These included the slowness in their compilation (leading to obsolescence as a management tool), and their inability to provide a comprehensive coverage of needs (de Ville de Goywt and Morinière, 2006).

- The likely absence of a stable communications infrastructure to act as the bearer for data transmission. For example Denning (2006), in describing the challenges facing "Hastily Formed Networks" that are designed to deal with unexpected disasters, underlines that one of the challenges is that "Critical infrastructures such as communications, electricity, and water do not work." Similarly, Banipal (2006) in his

analysis of the lessons to be learned from Hurricane Katrina clearly outlines the failures in the cellular communication service, and the resultant impact on the disaster relief effort.

- The absence of inter-agency commonality in standards, policies, processes or procedures. For example, recent research by Grant (2007) showed that there are a plethora of forms used by different NGOs as part of the Needs Assessment process, and there is precious little agreement over the data to be captured or even the metrics to be used. This is underlined by Telford and Cosgrove (2007) who suggest that, in the 2004 Asian tsunami, multiple NGOs conducted assessments but these were rarely shared.

- The transient nature of the logistic community which militates against organizational learning. This has been demonstrated in many of the recent major disasters and, for example, Telford and Cosgrove (2007) underline the limited surge capacity of many NGOs, and the overall shortage of appropriately experienced personnel who can operate in an emergency at an international level. Furthermore, as discussed above, it has been estimated by Thomas and Mizushima (2005) that many NGOs remain in their jobs for less than two years. As an example of the consequence of this, the UN Joint Logistics Centre which was deployed to support the relief of Hurricane Nargis in Burma in 2008, included secondees from 9 different organizations (UNJLC, 2008).

Unsurprisingly, therefore, there is good evidence that the current "system" is not operating well. For example, Bennett *et al* (2006) observed that in the aftermath of the 2004 Asian tsunami:

> "The issue of data analysis has confounded HIC [United Nations Humanitarian Information Centre] from the outset – how to add value to an abundance of often contradictory data, and how to exclude sub-standard data. Lack of resources and priority prevented HIC from screening documents – to analyze, synthesize and compile the results rapidly in a format practical enough to highlight gaps. A transition from information management to knowledge management would, however, require more funding, staffing and skill sets than are currently available.

Similarly, Zhang *et al* (2002) suggest that there is no overarching framework for humanitarian information systems to guide the way in which information is gathered, organized and analyzed. These authors then go on to propose a model which, amongst its other elements, includes the requirement for indexing and categorization – aspects of the overall HLKMS that this paper aims to address. Whilst Maxwell and Watkins (2003) take the view that information systems put in place to help meet emergency programme requirements may be very incomplete, ineffective or inefficient and, in a commentary on the 2008 Cyclone Nargis disaster in Burma, Ramalingam and Pavanello (2008) state:

> "Given current knowledge gaps faced by operational agencies, collecting and synthesizing the different types of available information has the potential to make a crucial difference in the humanitarian performance."

In short, as emerged from a major conference organized by the US Institute of Peace in 2000, there is a clear need for a standardized structure of humanitarian coordination and information sharing to meet their respective and common needs (US IoP, 2000). Whilst it might be argued that what is required is simply improvements to the current system of information management, there are many areas such as needs assessment and the broader sharing of "intelligence" about a particular disaster in which standardization has been seen as a key driver of improved supply chain management (de Ville de Goyet and Molinière, 2006). On the other hand, there is also evidence from research into commercial supply chains (e.g. Cachon & Fisher, 2000) that information sharing has a positive benefit on the effectiveness and efficiency of the chain in environments where the level of demand is difficult to forecast. This is even more so when the circumstances of the disaster lead to the creation of HFNs in which the importance of communications is even greater as the members of the chain cannot necessarily rely on the experience of colleagues and/or the use of standard procedures to overcome the inevitable information breakdowns (Denning, 2006).

The Aim of the Research and the Structure of the Paper

The introduction has attempted to demonstrate some of the challenges in the provision of logistic support in the aftermath of a disaster, especially those which can be categorized as "rapid onset". Such disasters are, typically, the result of hydro-meteorological events (avalanches/landslides, floods, forest fires, etc), geophysical events (earthquakes, tsunamis and volcanic eruptions) or technological events (gas leaks, transport accidents, etc) [(EM-DAT, 2008) in which the warning time does not exceed some 48-72 hours. This can be contrasted with "complex emergencies" such as famines which, typically, have a long gestation period (Van Wassenhove, 2006). It is emphasized that this challenge is both technical (i.e. delivering support against the backdrop of devastated infrastructure etc), as well as organizational (e.g. multiple HFNs). It is argued that, in the same way that recent developments in information management have resulted in a step change in the efficiency and effectiveness of commercial chains, such improvements have the potential to achieve similar advances in humanitarian logistics.

It is, of course, recognized that such improvements will take time – particularly in the absence of the "for profit" business model and in the presence of a funding regime that provides only limited support in the periods between disasters. As pointed out by van Wassenhove, the main issue holding back many NGOs is the lack of funds to finance training and procedural improvements that will lead to better preparedness. In this respect, he quotes the former head of logistics for the IFRC:

> "It is easy to find resources to respond, it is hard to find resources to be more ready to respond." (Van Wassenhove, 2006)

Therefore, as a first step towards the development of a broad HLKMS, the aim of this paper is to propose a taxonomy that would provide a framework into which existing and emerging knowledge, information and data on humanitarian logistics can be classified. Such a taxonomy being defined as a high level, hierarchical classification for documents and records that facilitates the management of recorded information throughout its life cycle (Choksky, 2006).

The paper begins by presenting a generic model of information management and discussing the role of taxonomies as building blocks of knowledge management. It then develops a taxonomy built on a combination of the Supply Chain Council SCOR model and the UK Armed Forces' concept of Lines of Development before suggesting how this might be pilot tested. In the final section, a number of areas of further research will be outlined, as these hold the key to further development of the HLKMS concept.

Information Management and the Role of Taxonomies

There is a general acceptance amongst researchers in the information management field that there is a hierarchy of increasing complexity that runs from Data through to Knowledge and, ultimately, Wisdom (see, for example, Tobin, 1996 and Gamble and Blackwell, 2001). Whilst the exact form of words to describe each level can differ between authors, the following (drawn from King (2005) are indicative of the literature:

- **Data:** A collection of related facts usually organized in a particular format such as a table or database and gathered for a particular purpose

- **Information:** Data that has been interpreted, verbalized, translated or transformed to reveal the underlying meaning or context.

- **Knowledge:** The internalization of information, data and experience. This can be further sub-divided into:

    - **Tacit Knowledge** which is the personal knowledge resident within the mind, behavior and perceptions of individual members of the organization.

    - **Explicit Knowledge** which is the formal, recorded or systematic knowledge that can easily be accessed transmitted or stored in computer files or hard copy.

Within this hierarchy, this paper is focused on the management of knowledge and, in particular, explicit knowledge. This management function is also variously defined, but is generally seen as a strategy to collect, store and retrieve knowledge in a systematic way, and then distribute the results to those

who need it in a timely manner. As such, a knowledge management system must provide a mechanism that will capture, sift/filter, judge, index, file, make available and weed the information and its underpinning data (Gamble and Blackwell, 2001; Zhou *et al*, 2002; King, 2005; and de Vasconcelos *et al*, 2005). In the context of this paper, therefore, and against the background of the perceived requirement to develop a KMS to support the international humanitarian logistics effort and its associated mass of data, this paper proposes a means by which such data could be indexed and filed and, through this and associated activities, become meaningful information that supports the creation and maintenance of explicit knowledge.

Within the generic model of information management discussed above, taxonomies are designed to play a key role in balancing the contradictory forces of maximizing the information held within a given system, and the need for individual users to be able to achieve timely access to the right information for the task in hand. Indeed, any organization that aims to make significant volumes of information available in an efficient and consistent way needs to understand the value of a serious approach to taxonomy design and management.

Unsurprisingly given the nature of the NGO community and, in particular, the mandate of each organization, information is managed in a unique fashion that, in most cases, has developed as a result of custom and tradition. To an extent the information is made public through, for example, the organization's web site, it is generally indexed chronologically, geographically or in relation to a particular disaster. Thus, the information is generally not arranged in a way that allows easy dissemination to, for example, the logistic community. Thus, typically, a "lessons learned" report will review the broad range of activities of the subject organization and, although this may well include a section on logistics, this will potentially be hidden within a significantly larger document. Thus, for example, the UNICEF Lessons Learned report following the Asian tsunami (UNICEF, 2008) has one section out of 6 devoted to logistics (11.5% of the word count). By the same token the IFRC Real Time Evaluation of the movement's response to the same disaster contains 5 references to logistics and supply chain management in a 52 page report (Bhattacharjee, 2005).

Interestingly, from a theoretical standpoint, Thomas and Kopczak (2005) take almost the opposite view suggesting that, by its very nature, logistics data can provide a valuable end-to-end perspective on the effectiveness and efficiency of an operation and that this can be analyzed to provide valuable post-event learning. It is argued, therefore, that in order to provide improved learning both within a particular NGO as well as across the NGO community, an improved structure for organizing and synthesizing the lessons identified from a disaster would be of considerable benefit. However, given that the focus of this paper is on humanitarian logistics – not least because in the authors' eyes provision of this is the key role of many NGOs – we will now suggest a more focused approach that develops a suitable information taxonomy which could act as one of the building blocks of a broader HLKMS.

SCOR and "Lines of Development" (LOD) – a Potential Taxonomy

At its most basic, a taxonomy is simply a mechanism for describing the framework in which data can be arranged in a system that is logical to both those posting and accessing the information. This process is a key element of the transformation of such data into information and, therefore, the choice of taxonomy is a key factor in the efficiency and effectiveness of the resulting KMS. For a putative HLKMS, the need for the taxonomy to be logical to both those inputting and abstracting data is of particular importance given that the users will potentially belong to a multitude of organizations, speaking many languages, and reflecting variable levels of experience and expertise in both logistics and information management.

With this in mind, the proposed taxonomy deliberately draws on existing models and concepts which are both familiar to at least some users and have stood the test of time. In this respect Lambert *et al* (2005) have identified five different SCM frameworks that recognize the need to implement business processes across corporate functions and across firms. Of the five frameworks these authors identified, only two fulfilled the criteria of describing processes in sufficient detail to be implemented, and this led to a closer examination of two frameworks: the GSCF framework (Global Supply Chain Forum), and the SCOR framework (Supply Chain Council's Supply Chain Operations Reference) developed by the Supply-Chain Council (SCC). The GSCF framework has been applied in academic literature (by, for example, Spens and Bask (2002), and can be said to be of more strategic nature than the SCOR model. SCOR's value in the context of this research is that it addresses the symptoms of SCM through tactics and it includes benchmarking data that may be used to improve operational efficiency, which is appealing to many executives (Lambert *et al*, 2005).

The Supply Chain Council (SCC) argues that it has established the world´s most widely accepted framework for evaluating and comparing supply chain activities and performance. This is corroborated by researchers who recently note that the SCOR model is very well known and used in various industries around the world. Employing the model as a means of analyzing the operation of a supply chain using its components of Plan, Source, Make, Deliver and Return, many companies have adopted SCOR based performance metrics as standard criteria for evaluating their SC performance (Theeranuphattana and Tang, 2008). Furthermore, the Supply Chain Council web site (SCC, 2009) offers a wealth of advice and assistance in using the mode, thereby making the SCOR model a good candidate to draw on.

The other model that we draw on is used by the UK military and called the "Lines of Development" (LOD). It was codified as a result of a number of major procurement failures such as that relating to the Apache helicopter. These were purchased and delivered on schedule, but the Army had failed to carry out the parallel training of the pilots and engineers. As a result, the new helicopters

had to be placed in mothballs for a considerable period at a cost of some $10million/year until the training was complete (NAO, 2002). A similar recent example was the failure to cost the training of operators, maintainers and systems managers for the Bowman communications system correctly. This led to an upward revision of the cost of this element of the capability of some $300M over 25 years (NAO, 2006).

It is recognized that, at first sight, it may seem a strange choice to employ a military model in a humanitarian context but consideration of the characteristics of an emergency relief scenario demonstrates clear parallels between a humanitarian and military logistic operation:

- Firstly, rapid on-set disasters frequently (although not exclusively) fall into the category of "uncertain future events" the location, severity and outcomes of which cannot be accurately forecast (van Wassenhove, 2006).

- Secondly, they are characterized by major disruption to the physical infrastructure at the location of the disaster (Pettit and Beresford, 2005; van Wassenhove, 2006).

- Thirdly, there is frequently a loss of some or all of the normal functions of state, e.g. law enforcement, local government and, potentially, elements of national government as witnessed, for example, in the aftermath of Hurricane Katrina (Derthick, 2007). On the other hand, there will be an influx of both indigenous and foreign NGOs and, in many cases, military personnel (Couldrey and Morris, 2005; Telford and Cosgrove, 2007).

- Fourthly, the disaster area will almost certainly contain large numbers of injured and/or traumatized individuals, with an equally large number of homeless and/or displaced persons and families. For example, the estimates of casualties following Cyclone Nargis that struck Burma in 2008 could be as high as 1,000,000 dead (HRC, 2008).

- Finally, there is likely to be a heavy presence from the world's media – with associated interest from both the general public and politicians in many countries (IBLF, 2005).

Therefore it can be seen from the above generic description of a humanitarian disaster that it also represents an accurate reflection of many of the circumstances surrounding the use of a country's Armed Forces. We argue that, given the similarities in the underlying environment in which both humanitarian and military operations are conducted, there is merit in considering the use of a model developed as a means of guiding the planning and execution of military operations to provide the same function in a humanitarian context.

The resultant proposed taxonomy is, therefore, considered to have the particular strength of using a well known commercial logistic model and combining it with a military model which reflects the similarities between the underpinning environment in which humanitarian and military logisticians must operate. Clearly alternative bases for such a taxonomy will exist, but none have the intrinsic merit of importing models that are a feature of the commercial and military logistic environments that represent a significant influence on current humanitarian logistic practice.

The SCOR Model

Consider the SCOR model in greater detail. It is:

> "… a process reference model that has been developed and endorsed by the Supply-Chain Council as the cross-industry standard diagnostic tool for supply-chain management. SCOR enables users to address, improve, and communicate supply-chain management practices within and between all interested parties." (SCC, 2008)

In theory, therefore, it would be possible to analyze relevant reports such as those held on the web-sites or in the archives of NGOs, and (subject to clearing any hurdles associated with Intellectual Property Rights (IPR), and gaining the organization's agreement), place links to these reports within a framework based on the SCOR model. In order to reduce the potential complexity of such an approach, it could be bounded by the development of a series of parallel databases associated with each major NGO engagement. Thus there could be one collection of data related to the 2004 Asian Tsunami, a second for the 2005 Pakistan earthquake, etc; with, perhaps, a high level collection of issues that relate to many, if not all, humanitarian logistic operations. Each of the databases could be further cross-referenced by other variables such as date, geography, etc, but the basic layout of the data would reflect the SCOR framework:

2004 Asian Tsunami	Plan	Source	Make	Deliver	Return
2005 Pakistan Earthquake	Plan	Source	Make	Deliver	Return
Macro Humanitarian Logistic Issues	Plan	Source	Make	Deliver	Return

Table 1. Basic Application of the SCOR model

Given that the SCOR model is widely used within commerce and industry, the use of the model should provide the necessary granularity to support an HLKMS. However, in practice, each organization that adopts the SCOR model

does so by adapting it to its particular operational requirements. There is, therefore, a danger that simply recommending the use of SCOR as the basis for the taxonomy will lead to a plethora of different interpretations across the members of the NGO community. What becomes clear is that the issue is to achieve the appropriate balance between a prescriptive model that will probably be ignored, and one that is suitable flexible and yet retains an appropriate structure to allow cross-organizational knowledge transfer. Thus, simply populating an HL MKS using just the SCOR taxonomy is likely to result in a mass of data within each "cell" of the model that does not pass the test of being readily accessible in a timely manner. To achieve this, we propose a further means of sub-dividing the data be added by using the UK Armed Forces LOD model.

The UK Armed Forces' Lines of Development (LOD) Model

The UK Armed Forces have developed what is known as Through Life Capability Management (TLCM) as means of balancing the potentially conflicting drivers of efficiency and effectiveness. An overview of this approach is shown in Figure 2:

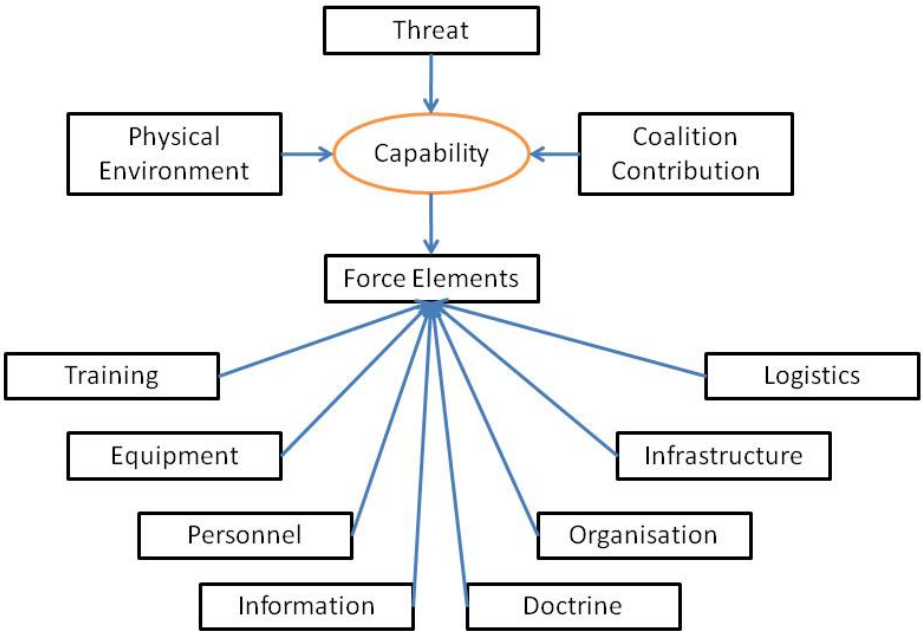

Fig. 2. Amended from the TLCM Model (MOD, 2008)

The top half of the model makes the relatively obvious point that the UK's military capability should reflect the best estimate of:

- The Threat. Any future enemies and their military capabilities.
- The Coalition Contribution. Those military capabilities that potential members of a coalition will generate.
- The Physical Environment. The location of a future conflict.

These three elements of the model can be relatively simply translated into a disaster relief scenario where the desired capability of an NGO to support those affected should reflect an estimate of the effects of a future disaster (the threat); the capabilities of the relevant governments and fellow NGOs (the coalition contribution); and the implications of the estimated location (the physical environment).

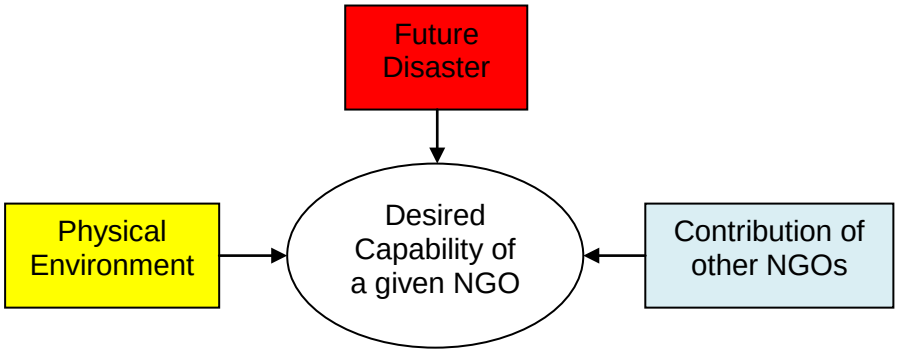

Fig 3. Application of TLCM Model to a Humanitarian Context

More importantly, however, is an appreciation that, in the funding constrained environment of both military and humanitarian operations, integration of the eight factors (i.e. Lines of Development shown at the bottom of the diagram) are fundamental to the successful development of a future capability. For example, if it is decided to provide a more sophisticated piece of equipment, then this is certain to have knock on effects on the cost of personnel (i.e. more highly skilled), the training requirement, the infrastructure needed to maintain the equipment, and the logistic support in the sense of the volume, nature and cost of the future demand for spare parts. There are also likely to be indirect effects, e.g. how will the new equipment actually be used (doctrine) and its communications requirements.

As an example of when the LODs were not correctly taken into account, the UK Ministry of Defence purchased the Apache helicopter in the latter part of the 1990s. The helicopters were delivered on time, but due to failures in developing the necessary infrastructure and recruiting appropriately skilled personnel, the training of the pilots was not completed in time. As a result, the helicopters were not used during two years, that is until the training was complete, and the overall additional costs were of the order of £40m (approx $60M) (NAO, 2002).

It was in fact this particular procurement problem that led to the codification of the LOD concept, and it has since been applied with increasingly good effect in helping to ensure that the true cost of all elements of a military capability are recognized even if they can only be forecast over the whole life of the capability with limited accuracy.

In reality, many of the LODs have already attracted attention from those seeking to improve the humanitarian logistic response. For example, Thomas and Mizushima (2005) underline the need for improvements in the training of humanitarian logisticians, whilst Chaikin (2003) discusses the need for logisticians to have management experience and also improved information systems – the latter point being supported by Chomilier *et al* (2003). However, a key aspect of the LOD model is that it reminds users that the elements are interlinked. Thus, any change to one element will almost certainly lead to consequential changes in the remaining seven LODs – albeit the magnitude and direction of the change is unlikely to be uniform. It is also important to appreciate that the approach of using LODs to ensure the integrated nature of the logistic response applies in all phases of that response – i.e. the Plan; Source; Make; Deliver; Return dimensions of the SCOR model.

Interestingly, within the UK Ministry of Defence, consideration is currently being given to the benefits of adding a ninth LOD to the model which would be called "interoperability" (MOD, 2008a). This aims to reflect the needs of the different elements that make up the UK's Armed Forces to be integrated with the minimum of inefficiency into so-called "agile mission groups". Yet again, there is a read across the humanitarian logistic context where the LOD of interoperability would usefully reinforce the benefits of a common, inter-NGO, approach.

It could be argued that the LOD model would represent a sound basis on which to develop the proposed HL taxonomy. It undoubtedly has such a potential, but on the other hand it is anchored in the development of a military capability. Putting aside the potential difficulties that many NGOs would have in importing such a military model as the basis for a KMS, the outcome (i.e. a capability) is also at too high a level. The key benefit of the LOD approach is the way in which it emphasizes the integrated nature of any military (and, by extension, humanitarian) response. In effect, each of the LODs can be underpinned by another set of LODs – thus, to take logistics as an example, it can be decomposed into a further series of interlocking issues that reflect logistic doctrine, logistic training, logistic infrastructure, logistic personnel, logistic information, logistic equipment, etc.

The Proposed Humanitarian Logistics Information Management Taxonomy

Building on this approach, the proposed taxonomy combines the two presented models, i.e. the SCOR and LOD models. In effect, it aims to take the logistics LOD and develop it in two dimensions. Firstly, the concept of logistics is broken

down into its key stages (as defined by the SCOR model), and then each of these are further broken down into their own sub-LODs. The outcome is described by means of a framework such as that shown in Table 2. It is further argued that, if improvements to the logistic response are to be managed using such a framework, so too should the associated information – and, hence, the model also becomes a candidate for the proposed information management taxonomy.

	Plan	Source	Make	Deliver	Return
Training					
Equipment					
Personnel					
Information					
Doctrine					
Organization					
Infrastructure					
Logistics					

Table 2 Integration of SCOR and LOD models

However, given the complexity of the information management challenge, it is proposed that the basic taxonomy of Table 2 be used to support information that relates to a particular incident, country or region. As shown in Figure 4, issues relating to the planning of training in the 2004 Asian tsunami would be placed in one segment and for the 2005 Pakistan earthquake in another. If there are any cross-cutting issues relating to this subject, then they would be placed in the equivalent segment at the macro-level.

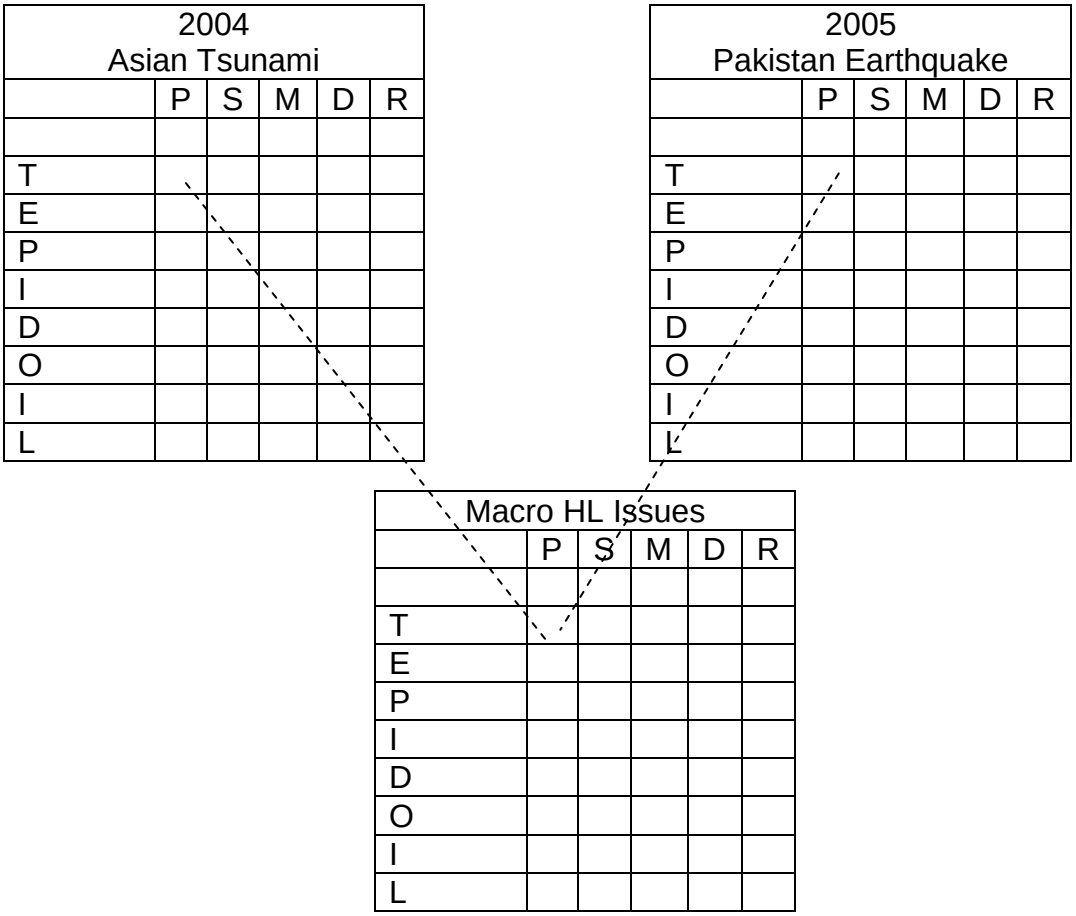

Fig. 4. Schematic of the Proposed Humanitarian Logistic Information Taxonomy

Ownership of the Taxonomy

A simple review of any of the websites of the major NGOs will quickly demonstrate that there is already a massive body of existing information that requires organizing. As an example, the OXFAM GB Web Site (Oxfam, 2008) lists 29 Policy Papers published in 2007 all of which are likely to contain logistic lessons in some form or another. The total number of reports readily available from this source alone exceeds 250, and it is reasonable to assume that every single UN Agency and NGO holds information that could, potentially, be of use to the humanitarian logistic community as a whole. However, given the voluntary and self-governing nature of the NGO movement, advances are only likely to be made if the organizations can see merit in what is proposed – in other words, that any investment that they must make can be justified in terms of the improvements that it will bring to the beneficiaries that each organization seeks to support. Equally importantly, as clearly exposed by Stephenson (2005), the cost to the NGO, for example in terms of its loss of control and/or diversion of scarce resources on what are sometimes perceived as non-core activities, must be acceptable. This lack of a coordinated and concerted pan-

NGO approach to disaster relief has been the subject of frequent critical comment, for example that from Telford & Cosgrove of the Tsunami Evaluation Coalition (Telford and Cosgrove, 2007). By the same token, the recent introduction of the "cluster" concept within the UN family of agencies (World Food Programme (WFP), Children's Fund (UNICEF), etc) is designed to achieve a more closely coordinated response. Thus a number of clusters (such as camp management, water and sanitation, logistics and communications) have been designated. Each of these has a UN Agency taking the lead as a means of trying to increase the overall cooperation and coordination (UN, 2006).

Yet, regardless of these difficulties, there are frequent and repeated calls for greater coordination and/or cooperation of the relief effort between NGOs (e.g. and, at least in part, it is argued that this would be aided by a greater commonality in the management of information. In this context, the United Nations Joint Logistics Centre (UNJLC), has a key role in line with its mandate which is

> "…to provide Logistics Information Management support and services. This involves providing an information platform for the gathering, collating, analysis and dissemination of logistics information…" (UNJLC, 2008a).

Clearly, the operation of the UNJLC is limited to the UN agencies and those NGOs that wish to operate with it, but <u>if</u> a HLKMS were to be developed that provided practical assistance to <u>all</u> those involved in humanitarian logistics, its use would become second nature and would help to ensure a greater degree of coordination as well as the spread of best practice. This, in turn, would lead to a greater effectiveness and efficiency in the humanitarian logistic response with consequential improvement in the extent to which the beneficiaries can be assisted and a reduction in the associate cost. The UNJLC, therefore, offers a potential route for the wider development and testing of the taxonomy that is proposed in this paper. To achieve such a momentum and to understand the practicalities of the use of the proposed taxonomy, it is likely that a pilot based around one of the LODs (e.g. training) would prove a valuable exercise in testing the approach and exposing it to NGOs who through the process of contributing to it may begin to gain a sense of ownership.

Further Research

As indicated at the beginning of this paper, it has deliberately aimed at offering and justifying a conceptual model of a taxonomy that could be used to support a nascent HLKMS. It is built on the benefits of two models that, individually, have clear provenance in their respective field of commercial and military logistics. To the extent that humanitarian logistics straddles these two disciplines, the proposed taxonomy is seen as a logical development. Unfortunately, however, there is clearly no guarantee that this perspective will be similarly held by users – be they these individuals posting data into the proposed KMS, or those who

wish to access the resultant information. This is particularly true given the breadth, background and relatively transient nature of the humanitarian logistic community. The next stage of the research is, therefore, the creation of a dummy database that is populated with appropriate information. The ease of access to the information would then be tested by inviting practicing humanitarian logisticians to, for example, "find all documents relating to the lessons relating to training in the planning phase of the response to the 2004 Asian Tsunami". It is hoped that this will be undertaken during 2009, and the results presented for publication at a later stage.

Whilst valuable in itself as a means of testing the user-friendliness of the taxonomy, such an approach will also help to shine a light on a number of management issues relating to the capture, storage, archiving, quality control, accountability and security/privacy/confidentiality of the proposed KMS. Indeed, it will be readily appreciated that one of the key challenges facing the owner of such a data-base will be the need to discriminate between "good" and "poor" advice. This, in turn, lifts the lid on a whole raft of new issues including, for example, the basis on which such editorial judgments should be made. However, one possible approach might be through the use of a moderated "virtual community of practice" that is able to take a view on material after it has been posted.

However, whilst such issues are clearly important and undoubtedly merit further research, to do so has the potential to take one into the difficult area of inter-NGO and UN/NGO relationships that can be the source of some friction (Whiting and Ayala-Őström, 2007). Rather, as discussed earlier, the authors would hope that the intrinsic merit of an appropriate information management taxonomy may lead to its development and use. In parallel, it is hoped that the necessary management structures would grow with the all important support of the user community. This research may, therefore, be seen as one small element in what Solomon and Brown (2004) describe as "creating conditions that enable separate organizations to share information toward a common end".

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