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AN EXPLORATION OF TRUST AND SHARED VALUES IN UK DEFENCE SUPPLY NETWORKS

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Biography

Peter Tatham joined the (UK) Royal Navy as a logistics officer in 1970, and served in a variety of appointments during a career of some 35 years during which he rose to the rank of Commodore. Following his retirement from the RN, he joined the faculty of Cranfield University where he lectured and researched in the fields of military and humanitarian logistics. Peter's doctoral thesis investigated the role of shared values within UK military supply networks, and this work received the 2010 Emerald/EFMD Outstanding Doctoral Research award in the logistics/supply network management category. Peter joined the faculty of Griffith University, in Queensland Australia, as a Senior Lecturer in July 2010 and he has also been appointed the Australasian Editor of the Journal of Humanitarian Logistics and Supply Chain Management, and to the Editorial Board of the International Journal of Physical Distribution and Logistics Management.

Abstract

Purpose - This paper develops a 'line of sight' between improved military capability through supply network effectiveness to trust and shared values, and tests the proposition that the effectiveness of the UK's military supply network (SN) will reflect the extent of the shared values within that network.

Design/methodology/approach - Using a three unit case study, the extent of the shared values is tested using a computer aided text analysis technique and an amended version of the Kuhn and McPartland twenty statement test.

Findings - The research was unable to demonstrate alignment between higher levels of shared values and SN effectiveness. This may reflect the marked differences between commercial SNs which incorporate an assumption of near total elasticity of supply and aim at 'On Time In Full' delivery, and their military counter parts which, not least for budgetary constraint reasons, do not have the same drivers of performance.

Research Limitations/Implications - Further investigation should be undertaken to examine the generalisability of the research findings both within the UK and internationally.

Practical Implications - The research underlines the caution that should be exercised when attempting to migrate commercial SN management thinking to a military environment.

Originality/value - Notwithstanding the vast sums expended on the provision of defence logistics, there is only very limited consideration of how best to achieve the appropriate balance between efficiency (low cost – especially in peacetime) and effectiveness (life saving – especially in war). This research offers some early insights using two novel techniques that represent valuable alternative means of understanding the impact of issues such as trust and shared values within SNs.

Key Words Military logistics; defence logistics; military supply networks; defence supply networks; trust; shared values

Article Classification Research Paper

Introduction

In the aftermath of the United Kingdom's (UK) 2003 military operations in Iraq, the performance of the supply network supporting the country's armed forces came under particular scrutiny. Thus, for example, the House of Commons Public Accounts Committee (PAC) noted in their subsequent report that: "As a result of a combination of shortages of initial stockholdings and serious weaknesses in logistic systems, troops at the frontline did not receive sufficient supplies in a range of important equipments..." (PAC, 2004, p. 5).

Similar concerns were voiced by the UK National Audit Office (NAO): "The huge logistic effort was fundamental to the success of the Operation, but improvements need to be made to ensure the effective delivery of supplies to the frontline". (NAO, 2003, p. 3), and by commentators such as the Commanding Officer of one of the Regiments involved in this conflict: "...the delivery of logistic support to the front line during operations around Basra, Iraq, in early 2003 was woefully inadequate and has left a lasting mental scar on those soldiers in our care – a scar that will not readily heal." (Blackman, 2005, p. 11). Indeed, although the focus of this research reflects the UK military supply networks, there are clear similarities with the challenges of sustainment during the same conflict reported from the United States (Peltz *et al.*, 2005; Peltz *et al.*, 2005a).

In response to such concerns, the Chief of [UK] Defence Logistics acknowledged the need to build greater confidence in the ability of the defence organisation as a whole to meet and sustain logistic support for future tasks (DLO, 2005). Whilst this statement of intent unquestionably reflects a highly desirable outcome, it is equally clear that achievement of this goal was likely to be a complex, time consuming and expensive task. Nevertheless, given the significant advances in commercial supply network management (SNM) theory and practice over the previous 30 years, there would appear to be potential for considering the applicability of the underpinning drivers of such improvements in a military context.

Aim

One such driver is that of 'trust' which is cited by many researchers a key building block of a successful commercial partnership. The concept is, in turn, frequently underpinned by the degree to which entities within the network share similar values. The resultant aim of the research reported in this paper was to test the proposition that: *The effectiveness of the UK's Military Supply Network (MSN) will reflect the extent of the shared values within that network.*

The structure of the paper is as follows: firstly, the theoretical underpinnings of the research will be discussed, after which the overall research methodology and approach will be exposed. The results of the research are then offered, before a final section in which the implications of the research for the management of UK MSNs are considered. This section will also discuss the broader challenge of the management of military supply networks in times of severe resource restraint.

Theoretical Underpinnings of the Research

Whilst there were a plethora of avenues that could have been explored, it is relevant to note that the area of military supply network management is relatively untapped. Indeed, examination of the key journals in the SNM field identified through the work of Gibson *et al.* (2004) and Menachof *et al.* (2009) in their index of logistic research, teaching and outreach 'usefulness' showed that in the period 1 Jan 00 to 21 Oct 08 a total of 1,150 papers had been published, but only 9 related specifically to the application of this field in a military context. Thus, there was a paucity of directly related literature that might have identified potentially fruitful lines of research.

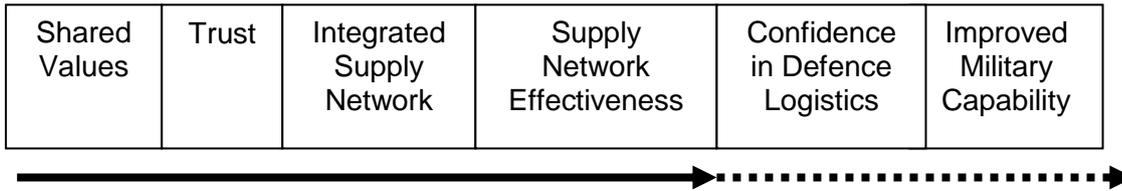
In parallel, at the time of the research described in this paper, the UK Ministry of Defence (MOD) had embarked on a significant programme of outsourcing of many support activities and the associated development of partnerships with key providers. With this in mind, the literature relating to such partnerships in a commercial environment was reviewed and it was noted that many researchers have identified the importance of trust to the success of a commercial partnership is that of trust. This has been mentioned in at least 34 papers during the period 1989-2006 and, as suggested by Lemke *et al.* (2003) and Fynes *et al.* (2005) it represents one of the key constructs in both a commercial and defence (Humphries and Wilding, 2004) context.

But what are the antecedents of trust? Again, it must be recognised that the concept itself is remarkable for the breadth of definitions and perspectives that reflect a major vein of research during the last decade of the 20th Century. This might be seen as culminating in a special edition of the journal of the United States Academy of Management in which Rousseau *et al.* (1998, p. 395) offered the following definition which, these authors claim, has support from a broad range of academic fields: "Trust is a psychological state comprising the intention to accept vulnerability based upon positive expectations of the intentions or behavior of another."

A further review of the literature, particular within the commercial SNM and associated partnering fields, indicates that a key element underpinning a trusting relationship is a common set of shared values (Bowersox, 1990; Lambert *et al.*, 1996; Dans and Teng, 1998; Kakabadse and Kakabadse, 2003; Sahay, 2003; Humphries and Wilding, 2004; Foster and Sturgess, 2005; van Rekom *et al.*, 2006; Hughes and Weiss, 2007; and Fawcett *et al.*, 2008). It is fully recognised that shared values are but one of the foundations of trust, but its importance can be underlined by the extent to which it mentioned within the trust literature.

In short, a line of sight through the literature was developed as in shown in Figure 1. The hard line shows the relevant antecedents of improved supply network effectiveness in the commercial arena that can be readily found within the literature relating to commercial supply networks, with the dotted line indicating the potential extension of this to the military field. It is emphasised that the effectiveness of a given supply network does not solely reflect the extent to which incorporates a level of trust (and an associated sharing of values), rather that the trust/share values axis is one that receives considerable attention in the literature and, hence, would appear to be of considerable importance.

Figure 1 Diagrammatic Overview of Literature Review
 (Source: The Author)



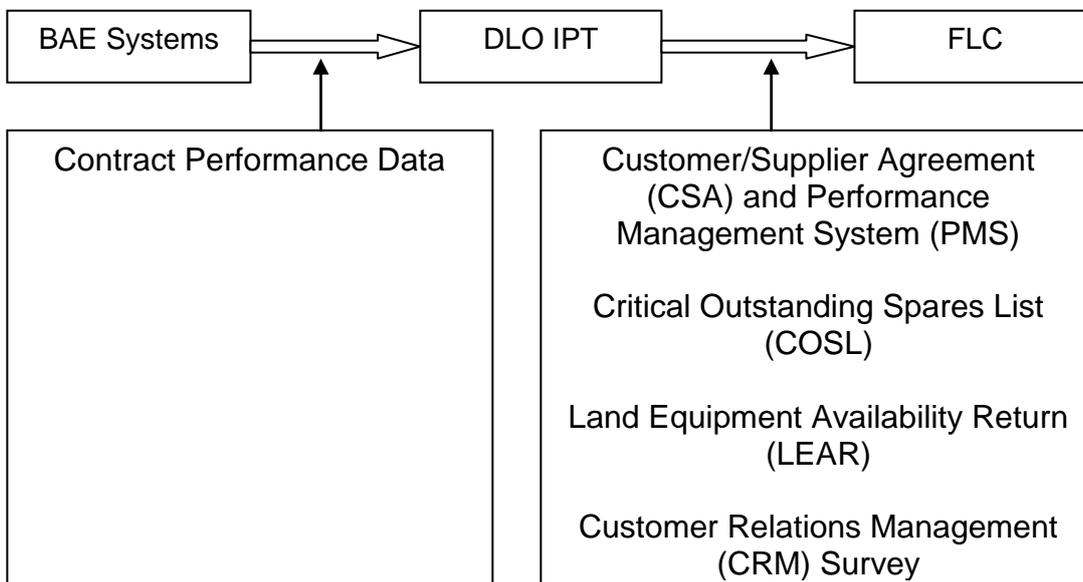
Research Methodology

In approaching the research, a balanced inductive/deductive approach was adopted (Golicic *et al.*, 2005) in which the review of the literature has identified a ‘phenomenon’ – namely supply network performance and, in particular, the sub-set of this which relates to the effect of an alignment of values within the network on the performance of that network. The literature surrounding this phenomenon has been briefly discussed, and this indicates that, within commercial supply networks, a positive relationship has been reported between the alignment of values within a network and the effectiveness of that network.

Field verification of this phenomenon has been offered by a number of other authors whose work supports the theory that there should be a positive correlation between the sharing of values within a supply network and its efficiency. With this in mind, the primary research was aimed at understanding whether the same phenomenon and underpinning theory applies in the UK military supply networks. To test this, an inductive approach was used in the shape of a single case study based on the UK’s MSN, with a number of embedded units of analysis that are the networks that support certain military equipment used by the British Army (Yin, 2003).

Reflecting on the line of sight described in Figure 1, the first issue was to ascertain how the effectiveness of the relevant military supply network was measured. Figure 2 provides an overview of the process that existed at the time of this research (mid-2000s). The selection of BAE Systems (BAES) as the original equipment manufacturer (OEM) reflects their role in the particular equipment supply networks that were studied, but Figure 2 reflects the generic performance measurement model within the UK MSN.

Figure 2. Data Sets used in determining the effectiveness of the MSN
 (Source: The Author)



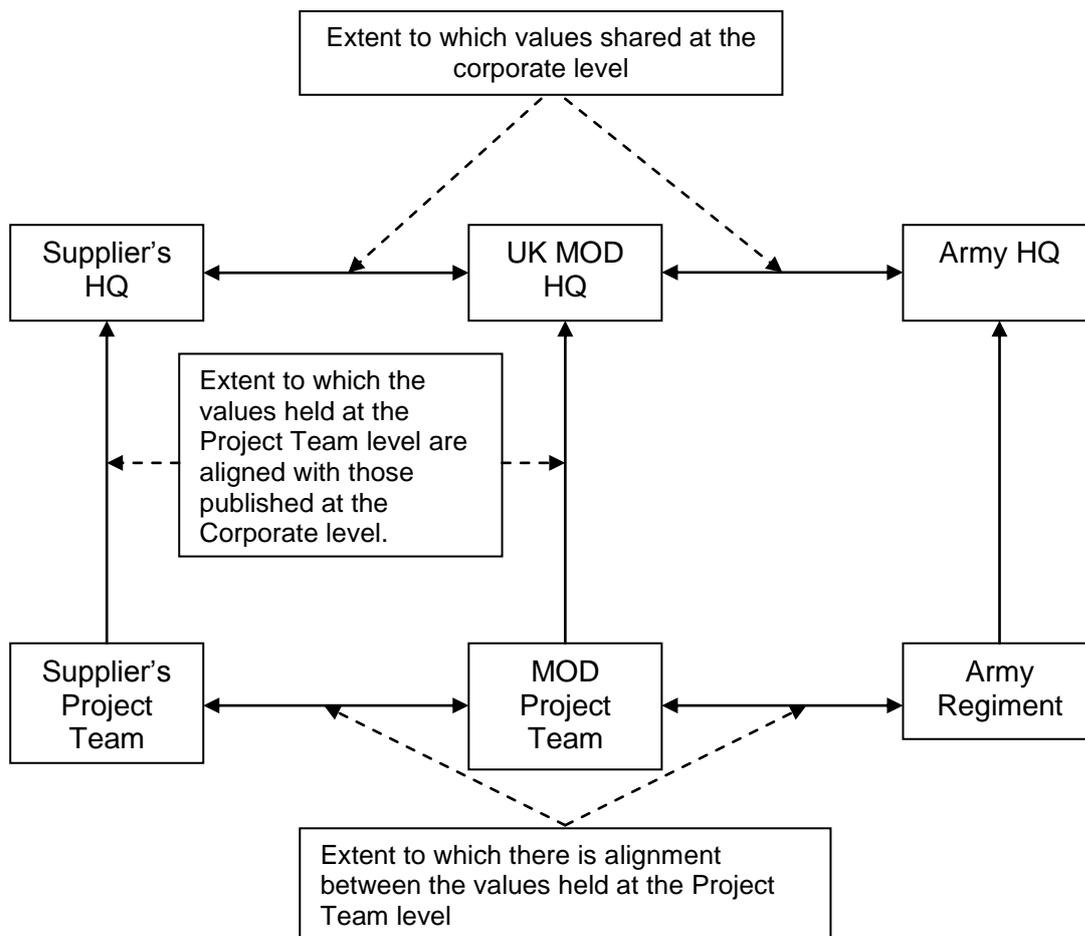
The first point to note is that there is an organisational triad in which the commercial organisation responsible for the support of the particular equipment – in this case BAE Systems – has a contractual agreement with the relevant ‘Integrated Project Team’ (IPT) that was, at the time, part of the Defence Logistic Organisation (DLO). Meanwhile, the IPT has a number of quasi-contracts and agreements with the appropriate organisations within the field army (denoted FLC, or Front Line Command).

Thus, importantly, there is no single measure of the effectiveness of the MSN – rather a series of proxy measures existed that have grown up over time and reflect the extant organisational construct and associated need to measure the inter-organisational interfaces. Nevertheless, by evaluating the various proxy indicators of effectiveness together with key informant interviews, it was possible to select two embedded units within the case study (the AS90 Self-Propelled Howitzer, and the Challenger II (CR2) Main Battle Tank) based on literal replication – in other words, their key performance indicators (KPIs) were broadly aligned. In addition, a separate embedded unit (the L118 Light Gun) was chosen as its KPIs were significantly superior, allowing theoretical replication.

Research Design

Within each of these MSNs under consideration, values could potentially be shared at the corporate level or at the project team level as shown in Figure 3.

Figure 3. Ways in which Values might be shared within the MSN (Source: The Author)



Methodology for Testing the Extent of the Shared Values

The extent to which values shared at the corporate level

The extent to which values were shared at the corporate level was first tested by a thematic comparison of the sets of those corporate values published by the entities in the MSN triad, and this showed very limited alignment. This was confirmed using the methodology of Boris Kabanoff and his colleagues who have conducted a number of studies in the area of organisational values. Thus, Kabanoff *et al.* (1995), Kabanoff and Holt (1996), and Kabanoff and Daly (2002) all suggest that there is considerable congruency in the views from across many fields of the study of organisations that supports the existence of a typology of four ideal types of organisations. These represent a differentiation between those organisations in which equity (in other words task, technical or production orientation) is predominant, and those equality-based organisations in which personal (or social/employee-orientated) issues hold sway.

Furthermore, Kabanoff and his colleagues postulated four value structures which are populated by nine 'espoused values' (see Appendix A), with such an espoused value being defined as one that senior managers: "... would like or prefer their organisation to be, or what they would like significant stakeholders to believe the organisation is like." (Kabanoff and Daly, 2002, p. 90)

In their investigations, Kabanoff and his co-researchers used Computer Aided Text Analysis (CATA) of corporate documents such as company reports to count the frequency with which the espoused values occurred. The values were then defined either as "strong" (frequently mentioned) or "weak" (infrequently mentioned), noting that weak values are not unimportant since the organisation's value structure is determined by both its strong and weak values.

Importantly, this stream of research is based on the premise that: "...institutions leave traces of their distinctive value patterns in documents." (Kabanoff and Holt, 1996, p. 207), and that by measuring the frequency in which key words and phrases occur in appropriate documents, it is possible to determine the organisational value structures. Furthermore, in subsequent research and analysis it was noted that there is a considerable degree of stability in the organisations' espoused values over time and, thus, it is suggested that not only do the values represent relatively enduring beliefs (Kabanoff and Daly, 2002), but also that the organisations' typology remains relatively static.

Clearly, as Kabanoff and his colleagues recognise, this approach incorporates two key assumptions: (1) The language used in such publications reflects the goals and values that organisations consider important. (2) The relative frequency in which words are used is an indicator of relative importance. Nevertheless, these researchers go on to demonstrate the general validity of these assumptions in an analysis of over one million words (Kabanoff and Holt, 1996). In doing so, they also raise a further criticism, namely that whilst the approach provides an insight into the stated actions and intentions of managers, these may actually be designed to, for example, give a particular impression to shareholders and not measure their actual thoughts and concerns. But this is addressed in a subsequent paper (Deviney and Kabanoff, 1999), which demonstrates there is a good correlation between the intentions or activities stated in company reports and actions (as evidenced by their research into the investment policies of the target companies).

It is fully accepted that this model is but one of several that attempts to understand organisational values. Nevertheless, it has the merit of offering a clear taxonomy which can be used as the basis for considering the extent to which the values of the organisations under investigation in this research are aligned.

The extent to which the values are mutually held at the project team level and reflect the corporate values

In considering the extent to which the values are mutually held at the project team level and that they also reflect the corporate values, it was noted that Lotacelli and West (1996) have undertaken a comparison of three research data collection methods that were specifically used to investigate the parallel field of organisational culture. These were: Focussed Group Discussions (FGD); Repertory Grids (RG) and the Kuhn and McPartland Twenty Statement Test (TST). In analysing the efficacy of these three research techniques, the authors compared three aspects as shown in Table I:

Table I. Comparison of Three Techniques for Cultural Research
(Source: The author, drawing on Lotacelli and West, 1996)

Aspect	TST	RG	FGD
Level of Cultural Info Accessed	1. The TST and RG provide the most promising methods for assessing organisational culture. 2. The TST produced more statements relating to beliefs and values than the RG. 3. However, gaining agreement to the categorisation of statements into a cultural taxonomy proved contentious.		
Amount and Usefulness of the Information Gathered	1. The TST produced the most information. 2. The TST also produced the widest variety of information.	1. The RG produced the 2 nd most information.	1. The FGD produced the least information.
Ease of Use	1. The TST is relatively quick and easy to administer.		

In summary, the authors concluded that: "... the TST represents a particularly useful and empirically powerful method for tapping into culture in organizational settings." (Locatelli and West, 1996, p.20). As a result, this element of the research was based around a modified version of the TST (Kuhn and McPartland, 1951) which, following an initial exposure at the 2007 UK Logistics Research Network (LRN) conference (Tatham, 2007) and subsequent pilot application, was used to test the views of 67 respondents drawn from the MSNs supporting three items of UK army equipment: the Challenger II (CR2) main battle tank, the AS90 self-propelled howitzer, and L118 Light Gun.

Key Findings of the Research

The first part of the analysis – that of understanding the extent to which the corporate values were shared by the organisations forming the MSNs in question – was achieved through a simple thematic comparison of the published statements of these values. As will be seen from Table II, there are only two areas in which there is a mutually

coherent line of corporate values – and even this is questionable in that the Army values are very firmly rooted in the area of behaviour and moral standards. On the other hand the DLO values reflect both this organisation’s role as a supporter of the operational element of the Armed Forces; whilst BAE Systems values are firmly rooted in their business context.

Table II. Published Corporate Values

(Source: The Author, drawing on: The Army: Values and Standards of the British Army, HMSO March 2000; DLO Plan 2005; BAESystems: www.baesystems.com)

The Army	DLO	BAE Systems
To put others before yourself	Each of us understands and is committed to meeting the needs of the Armed Forces.	Customers – Our Top Priority. We will delight our Customers, both internal and external, by understanding and exceeding their expectations.
To earn the respect and trust of your comrades	We respect and value each other, encouraging our colleagues and appreciating our achievements.	People – Our Greatest Strength. All our people will be encouraged to realise their full potential as valued members of the team.
To treat others with decency at all times		
To face up to danger and do what is right.		
	We will deliver a professional service, at best value, getting better all of the time.	
	We will actively use our shared experience and knowledge.	
	We are committed to building one DLO, a community of mutually supportive teams.	
		Partnering – Our Future. We will strive to be the partner of choice, respected by everyone for our cooperation and openness.
		Performance – Our Key to Winning. We will set targets to be the best, continually challenging and improving the way we do things, both as individuals and as members of our teams.

However, as discussed in the preceding sections, a further level of analysis was undertaken using the CATA methodology described earlier using the sources listed in Table III.

Table III. Sources for the CATA Analysis

BAE Systems	DLO	The Army
2005 Annual Report (published 30 Mar 06)	2006 Defence Logistics Programme (published Mar 06)	2005 Army Management Plan (published Mar 05)
2005 Corporate Responsibility Report (published 30 Mar 06)	2006 DLO Plan (published Mar 06)	Army Doctrine Publication – Land Operations Published 2005
BAE Systems News: 5 Editions Q3 2004 – Q2 2006	DLO News – 6 Editions: Feb – Jul 06	
RANGE (BAE Systems Land Division Newspaper): 4 Editions: Sep 05 – Jun 06		

Unfortunately, as will be seen from the entries in Table 3, whilst it was possible to identify suitable business-orientated corporate documents for BAE Systems and the DLO, unsurprisingly, this proved more problematical for the Army and those selected were the best approximation.

The raw data of the incidence count for each word was “normalised” (in other words divided by the total number of words found for the organisation in the relevant document) in order to ensure comparability and then, for ease of discrimination between ‘Strong’ and ‘Weak’ values, the median figure was subtracted. The results are to be found in Table IV.

Table IV. Results of the CATA – showing the Strong and Weak Values of the MSNs under consideration (Source: The Author)

	BAES	NST-M	DLO	NST-M	Army	NST-M
Strong Values	Authority	0.30	Teamwork	0.37	Normative	0.16
	Performance	0.16	Authority	0.16	Authority	0.07
	Teamwork	0.09	Performance	0.10	Leadership	0.06
	Normative	0.09	Leadership	0.04	Performance	0.03
Weak Values	Leadership	0.00	Normative	0.00	Teamwork	0.00
	Affiliation	0.00	Affiliation	-0.02	Commitment	-0.01
	Commitment	-0.01	Participation	-0.02	Participation	-0.09
	Reward	-0.02	Commitment	-0.03	Affiliation	-0.09
	Participation	-0.04	Reward	-0.04	Reward	-0.11

Note: ‘NST-M’ = Normalised Sub-Total less Median

From the data it will be appreciated that there are a number of patterns to the Strong and Weak Values as highlighted in Table V.

Table V. Results of the CATA with specific Strong and Weak Values highlighted (Source: The Author)

	BAES	DLO	Army
Strong Values	Authority		
	Performance	Authority	Authority
		Performance	Leadership
		Leadership	Performance
Weak Values	Leadership		
		Participation	Participation
	Reward		
	Participation	Reward	Reward

From Tables 4 and 5 it can be seen that, whilst there is no clear alignment between the corporate values held by the three organisations when analysed using the Kabanoff methodology, there are some general similarities – for example, Authority appears as either the 1st or 2nd value; whilst Reward is either the last or penultimate value. But, overall, the picture confirms the earlier thematic analysis finding in that it fails to show consistently equivalent importance placed on similar values.

In summary, from both the thematic and CATA data, no clear alignment of values was demonstrated at the corporate level between the key entities within the MSNs tested. This is a significant finding because each individual organisation’s reward and/or sanction policies and processes should be attempting to persuade their staff to align their personal and sub-corporate values with the corporate values. Therefore, if such an approach were to be successful and if, as demonstrated above, the corporate level values within the MSN are not clearly aligned, it follows that the overall coherence of the values within the MSN will also be fragmented and, according to the literature, this will have a negative impact on the effectiveness of the MSN overall

However, it is equally possible that the corporate values are not mirrored by those actually held at sub-corporate level. In other words, a different set of values is held at the sub-corporate level(s) which may, or may not, be shared across the MSN. Put simply, those working at the project team level may be broadly oblivious to the corporate values and/or have their own set of inter-organisationally mutually congruent values.

As outlined earlier, a modified version of the Twenty Statement Test (TST) was utilised to understand the extent to which the values are mutually held at the project team level, and the extent to which they also reflect the corporate values. In essence, Kuhn and McPartland suggested that: “...human behaviour is organised, the organization supplied by the individual’s self-attitudes or self-concept. ... self-attitudes could [therefore] be assessed by asking an individual verbally to characterize himself.” (Alm, *et al.*, 1972, p. 190).

The resultant test is a sheet of paper, at the top of which are the instructions: “There are twenty numbered blanks on the page below. Please write twenty answers to the question “Who am I?” in the blanks. Write the answers in the order that they occur to you; don’t worry about logic or importance.” (Alm, *et al.*, 1972, p. 190). Given the attraction of its simplicity and ease of administration, it is unsurprising that the TST has been used in at least 125 investigations and, furthermore, that it has outlasted other techniques for researching the concept of “self” (Spitzer, 1969).

Importantly, whilst the basic concept of inviting respondents to offer their opinion of a particular question using the TST has been expanded well beyond the initial study area, it does not appear to have been used for the study of individual, group or organisational culture or values in a supply network management context – the focus of the Lotacelli and West research being a single firm. To this extent, the use of the TST is considered to represent an innovative technique for SNM research.

Some researchers have, however, noted that the requirement to complete twenty statements has the potential to introduce bias. On the one hand, the requirement to provide 20 statements may lead to respondents introducing false information in order to meet their ‘quota’. On the other hand, it may result in a partial answer from a respondent who has a major contribution to make (in other words the individual could have responded with >20 statements). As a result, Schwirian (1964) recommended that both biases could be overcome by using a less specific introduction to the test which invited the respondent simply to write as many responses as he/she can to the question, and this was the approach that was adopted. Figure 4 contains an example of the rubric, with the key phrase (“The Army values...”) being amended to “The DLO values...” or “BAE Systems values...” as appropriate.

Figure 4. Amended Format of the Twenty Statement Test
(Source: The Author)

<p>On the blank page below, please complete the following sentence:</p> <p style="text-align: center;">“The Army values....”</p> <p>Write as many answers as you feel appropriate in the order that they occur to you.</p> <p>Don’t worry about their logic or importance, or how long each sentence is.</p> <p>Please begin each separate sentence on a new line.</p>

Following pilot testing, it was ascertained that the saturation point was reached with a group size of 8 and, as a result, the test was administered to some 8-10 staff from each of the organisational cohorts (BAE Systems, the DLO and the FLC) that supported each of the three equipments (AS90, CR2 and the Light Gun). Each individual was invited to complete three sets of data, in other words to respond to the questions.

- a. “BAE Systems values
- b. “The Defence Logistics Organisation (DLO) values
- c. “The Army values

The results were then analysed on a thematic basis, and a comparison undertaken firstly, between the perceived values of the respondents within an organisation and the corporate values of that organisation. For example, this process compared what the members of the DLO AS90 IPT perceived to be BAE Systems' values with the published BAE Systems corporate values. Secondly, by comparing all three sets of respondents' perceived values of both their and the other organisations in the MSN, it was possible to understand the perceived values of BAE Systems as seen through the eyes of the members of the BAE Systems IPT, the DLO IPT and the relevant FLC unit.

Before summarising the significant volume of data generated by this process, it is stressed that a number of assumptions are implicit in the analysis. These include the equality of importance (or weight) attached by the respondents to each of the values; the homogeneity of the population; and the extent to which the sample population reflected the organisation as a whole. Thus, confirming the generalisability and reliability of this research would require further iterations.

Summary of Results at the Project Team Level

In relation to the question of the extent of the alignment between the values held at the project team level and those published at the corporate level, and the following is a summary of the results from the AS90 and CR2 supply networks (ie those that were chosen on the basis of their broadly similar levels of effectiveness). The analysis concluded that:

- Within the AS90 and CR2 MSNs there is a similarly good level of alignment between the perceived and published BAES and DLO corporate values as perceived by the BAES and DLO staff, but this was less good from the perspective of the Army staff.
- There was a particularly good alignment between all three elements of the MSN as they related to two of the DLO's corporate values, and in this sense the DLO can be seen as operating in its role as a "span breaker" between the business and battle spaces.
- There was overall a considerable weakness in relation to the alignment between the perceived and actual Army corporate values.

In short, it would appear that for both BAE Systems and the DLO, the broad alignment between perceived and published corporate values can be described as sitting in a mid-range position (in other words neither very good, nor very bad). This conclusion is in stark contrast to the results for the Army where there is only limited alignment between the perceived and published corporate values across all three respondent groups. In addition, the respondents from the Army generated significantly less alignment in their view of both the BAE Systems and the DLO corporate values (as well as those for the Army).

Importantly, the addition of the data from the third embedded unit of analysis (the Light Gun) which had been selected on the basis of its relatively superior supply network effectiveness, did not result in any discernable difference in the extent of the alignment between the perceived and published corporate values as demonstrated by all three cohorts (BAE Systems, the DLO and the FLC).

Turning to 'horizontal' dimension of Figure 3, in other words the extent to which the values of the corporate organisation, as perceived by the members of each of the IPTs (or equivalent), mirrored each other. It will be appreciated that, in researching this aspect of the question, it does not matter whether the values are or are not aligned with the corporate values. Rather, to the extent that the literature suggests that the existence of shared values may positively impact on the effectiveness and efficiency of the supply network, vertical alignment is not a necessity. Simplistically, this scenario might be categorised as the working level being not hugely exercised over the corporate values, but holding a common set of values across the MSN that allows them to view issues from a similar perspective.

The following represents a summary of the results from the two supply networks (AS90 and CR2) that were assessed to be broadly similar in effectiveness:

- The level of alignment across the two MSNs of the perceived values of BAE Systems is good in the case of AS90, and very good in the case of CR2.
- The level of alignment across the two MSNs of the perceived values of the DLO is fair in the case of both MSNs.
- The level of alignment across the two MSNs of the perceived values of the Army is poor in the case of AS90 and very poor in the case of CR2.

Importantly, the addition of the data from the Light Gun 'outlier' once again made little difference to the overall picture and, indeed, in several instances the members of the Light Gun supply network actually offered fewer instances of shared values.

Discussion and Recommendations for Further Research

Within the limitations of the research that have been briefly exposed, the above results – and in particular those relating to the Light Gun (theoretical replication) when compared with AS90/CR2 (literal replications) – lead to the conclusion that the underpinning proposition of this research has not been demonstrated. In other words, there is no proven association between the effectiveness of the supply network and the extent of the shared values within that supply network.

Clearly there are a number of potential reasons for this result, the first of which relates to the underpinning theory. In this respect, it will be recalled that many researchers have reported that there is a clear alignment between the levels of trust within a supply network and its effectiveness. However, this suggestion has been challenged by the work of Fabbe-Costes and Jahre (2008) who have called into question the linkage between supply network integration and supply network effectiveness that is assumed by many working in this field. Importantly, these authors have not argued that such a link does not exist; rather that more research is required in order to demonstrate it conclusively.

Nevertheless, putting the concerns of Fabbe-Costes and Jahre to one side for the moment, it may be argued that the extension of the Kabanoff methodology and the use of a novel technique (the modified Twenty Statement Test) failed to provide a satisfactory measure of the extent of the shared values. This argues, therefore, for further research to triangulate these results (through, for example, interviews or the use of repertory grids).

A further key question is the extent to which much of the current research into supply network management that is grounded in the commercial world can be applied in a (UK) military environment. As an example, at the time the research was undertaken, the UK's defence inventory was of the order of 1.7M SKUs (LARO, 2005) with relatively long lead times (over 6 months for 70% of demands) and high unpredictability (over 80% of demands having a standard deviation/mean >3.0). Achieving supply network effectiveness across such a vast inventory in the face of the turbulence and volatility that is inherent in military supply networks is, self-evidently, significantly more challenging than in the Fast Moving Consumer Goods (FMCG) sector where a typical supermarket will stock 50-70,000 SKUs (Fernie and Sparks, 2004).

Furthermore, unlike the careful planning for supermarkets and other retail outlets whose locations are carefully planned to reflect the balance between warehousing and transport costs in relation to predicted demand, the MSN must be developed in an extremely short timescale (typically no more than three months), and implemented in a location that may well have been subject to only limited reconnaissance and with the aim of supporting a military force that moves (and hides!) (Taylor and Tatham, 2008). Unsurprisingly, therefore, the seamless delivery of the required support is not always achieved as clearly demonstrated by Peltz *et al.* (2005).

Indeed, the fundamental assumption of near total elasticity of supply that applies in the FMCG domain frequently does not apply in a military context where, for example, the complex transport requirements may lead to a shortfall of a given commodity in the operational theatre. This, in turn, requires a hierarchical command and control structure that, at least in part, exists to prioritise the distribution of scarce commodities. In this sense, the MSN is not necessarily driven by the demands of the 'customer' – in other words the military unit that is calling for the re-supply of the particular commodity. Rather, the distribution priorities are controlled from higher in the command chain where, in theory, allocation judgements will incorporate other factors such as the intelligence picture – and, hence, whether a particular military unit may require the stocks to defeat an impending attack.

Nevertheless, and notwithstanding the differences between commercial and military supply networks, it is argued that the latter should examine the former and understand the applicability of importing policies, processes and procedures. For example, the sharing of information via information systems (IS) is, arguably, the key aspect that has revolutionised FMCG supply networks (Sahin and Robinson, 2002). Given the complexities of the physical movement of materiel within a war zone, it is argued that equally large benefits could accrue from a similar investment in IS. Thus, a clear finding from this research is the need for those charged with managing and developing the UK MSN to learn appropriate lessons from the highly successful (and, indeed, unsuccessful) commercial applications of supply network management theory.

In this respect, however, there is potentially a lessening of the gap between the two generic forms of supply network (business and military). In particular, it has been powerfully argued by leading academics such as Singh (2009) from the Massachusetts Institute of Technology (MIT) Supply Chain 2020 project, Christopher and Holweg (2011) in the UK, and Gattorna and Ellis (2009) in Australia that commerce and industry are faced with an increasing and persisting level of business turbulence and instability. To this extent, and given that military supply networks (together with their humanitarian counterparts) reflect an extreme degree of volatility of demand (and, frequently, supply), the conceptual distance between the two areas can be seen to be diminishing.

Rather it is argued that, in both cases, there is a continuing need to develop supply networks that are able to ameliorate the impact of such volatility through the development of both dynamic and structural flexibility through strategies such as the holding of strategically located inventory, achievement of improved inter-organisational links so that the response to the customer (appropriately defined) is truly network-based, the creation and management of horizontal processes that overcome the challenge of vertical organizational silos, and the development of seamless virtual integration (Christopher and Holweg, 2011).

Such an approach can be seen as giving effect to Teece's Dynamic Capabilities model in which the author argues that such capabilities can be "...disaggregated into the capacity (1) to sense and shape opportunities and threats, (2) to seize opportunities, and (3) to maintain competitiveness through enhancing, combining, protecting, and, where necessary, reconfiguring the business enterprise's intangible and tangible assets." (Teece, 2007, p. 1319). Thus, for example, the synchronisation of activities through the sharing of information throughout the network is key to the ability of the network as a whole to sense and respond to the real time signals from the customers. Indeed, the underpinning 'sense and respond' approach reflects one of the key ways in which many armed forces are attempting to counter the threat posed by insurgents and has been incorporated into the so-called Revolution in Military Affairs that reflect much of the thinking of academics such as Bradley and Nolan (1998) and Haekel (1999) as well as, in the practitioner domain, of the late Admiral Cebrowski USN (the former Director of the Office of Force Transformation).

By the same token, the use of postponement techniques will enable a faster reaction to the same customer demand signals. Similarly, at an organisational level, adopting the agile approach would argue for the use of a Nike-style virtual organisation in which various activities (such as the physical storage and movement of material) are achieved through a series of contracts that can be turned on/off at short notice in response to the emerging picture of demand. Interestingly, a recent review of retail supply chain management challenges (Randall, *et al.*, 2011) suggests that 40% of the survey respondents highlighted supply chain agility as their primary goal – thus the value of moving towards this model would appear to have been understood by many supply network managers.

Developing this theme further, one significant difference between commercial and military supply networks was highlighted during the research. This relates to the generic objective of all commercial organisations which is to maximise their profit under the given market conditions. This, in turn, implies that (amongst other aims) they will try to develop the most efficient and effective supply network. As a result, the literature reflects the desire to create commercial supply networks that deliver "On Time In Full" (OTIF) (a measure of effectiveness) at minimum cost (a measure of efficiency).

In this respect, there is a stark contrast between the average 99.98% OTIF reported by a supplier of fruit and vegetables to major UK supermarkets (Tatham, 2005) and the levels of effectiveness deemed acceptable in the UK's MSNs. In the case of the latter, the generic level of acceptable supply network effectiveness can be extrapolated from the then extant Public Service Agreement between the UK MOD and the UK Treasury which was signed as part of the 2004 Spending Review. This details, *inter alia*, the levels of planned readiness that the MOD should be maintaining and the relevant target for the period was that: "... an average of 73% of Force Elements reporting no critical or serious weakness in achieving their funded peacetime readiness" (MOD, 2008, p. 50). In practice, however,

the subsequent MOD Annual Report indicates that this figure of 73% had not been achieved, with the level falling to 55% in the fourth quarter of 2007-8 (MOD, 2008, p. 50).

Doubtless this is a tangible reflection of the overall UK defence acquisition system which is an amalgam of many factors including the difficulty of designing reliable military equipment, the complexity of the supply networks, and the tautness of the overall defence budget. In particular, the need to remain within budgetary constraints typically leads to a pattern of behaviour in which the funding available for spares is reduced. As a result, spare parts are consumed and not replaced. Only when availability becomes seriously affected will additional spares be purchased. However, within the fixed budget for such spares, purchase of one SKU means that another SKU cannot be bought – and this results in platforms beginning to lose availability for a different reason.

Therefore, in clear contrast to the commercial model which generally incorporates a supply network that aims to achieve a zero defects (ie to deliver OTIF), the military model is heavily influenced by the need to remain within a budgetary ceiling and in which defects are, within agreed limits, tolerated. Given this difference in the basic supply network performance model, it could certainly be argued that even the most “joined up” supply network (in which the component organisations are totally trustworthy and share a common organisational culture and values) would not deliver improved equipment availability if there is insufficient funding to purchase the spare parts and other commodities that must be moved through the network.

Nevertheless, it is clear from the literature that many researchers would argue that greater integration of a supply network will result in improved efficiency. Indeed, even Fabbes-Costes and Jahre (2008) do not dispute this, arguing instead that the proposition has yet to be demonstrated in a rigorous empirical way. Therefore, assuming that improved integration of the elements of a supply network is indeed beneficial, then the results of the research described in this paper can be seen as the source of some concern.

The research has, first, highlighted that the published corporate values of the three key entities within three military supply networks were not aligned and, therefore, there is potential for the individual corporate reward/sanction mechanisms to drive the elements of the network apart rather than integrate them. Secondly, it has highlighted that the understanding of the values of the Army by respondents in BAE Systems and the DLO is poor as is, similarly, the understanding of the BAE Systems/DLO values by Army respondents. Therefore, whilst it is fully accepted that the achievement of trust (underpinned by shared values) is but one driver of supply network effectiveness, the results would strongly indicate that those responsible for the management of the UK’s military supply networks should focus more attention on this aspect of their challenge. In doing so, they may be able to ameliorate some of the impact of budgetary restrictions.

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KABANOFF'S ESPOUSED VALUE MODEL

As explained in the main text, Boris Kabanoff and his colleagues undertook a Computer Aided Text Analysis (CATA) of the published documents (Annual Reports etc) of a number of companies. The following Table shows the definitions of values used in their work.

Table A-1: The Computer-Based Text Analysis Dictionary

(Source: Kabanoff and Daly, 2002, p.94)

Category	Definition and Examples and Associated Search Terms (in italics)
Authority	Concerned with authority figures and relations, eg executive, manager, director. <i>Authority, Executive, Manager, Director</i>
Leadership	Concerned with leadership, eg leader, leadership. <i>Leader, Leadership</i>
Team	Concerned with teams and teamwork, eg team, team-work, co-operation. <i>Team, Teamwork, Cooperation</i>
Participation	Concerned with participation by non-managerial levels, erg participation, loyalty, dedication. <i>Participation, Consultation</i>
Commitment	Concerned with organisational reward system, especially remuneration, eg bonus, compensation, reward, salary. <i>Commitment, Loyalty, Dedication</i>
Performance	Concerned with performance, eg achievement, performance, service, efficiency <i>Performance, Achievement, Efficiency</i>
Reward	Concerned with organisational reward systems, especially remuneration, eg bonus, compensation, reward, salary. <i>Reward, Remuneration, Bonus, Compensation, Salary</i>
Affiliation	All words with connotations of affiliation or supportiveness eg share, enthusiasm, appreciate, join together. <i>Affiliation, Share, Enthusiasm, Appreciate, Join Together</i>
Normative	All rectitude values invoking social order and its demands as justifications, eg responsibilities, fair, rights. <i>Responsibility, Responsibilities, Fair, Rights</i>