

## Conceptualising a new model for Sustainable Supply Chain Management (SSCM) in the UK defence sector.

Victoria Stephens<sup>1</sup>, Chris Lee<sup>2</sup>, Jolyon Barrett<sup>3</sup>

<sup>1</sup> *University of South Wales, Pontypridd, Wales, CF37 1DL*

[Victoria.stephens@southwales.ac.uk](mailto:Victoria.stephens@southwales.ac.uk)

<sup>2</sup> *University of South Wales, Pontypridd, Wales, CF37 1DL*

<sup>3</sup> *University of South Wales, Pontypridd, Wales, CF37 1DL*

### Abstract

The paper aims to address the issue of achieving sustainable competitive advantage within the UK defence sector by improving supply chain performance. The paper looks at two defence sector change programmes, which have emerged in recent years with the aim of achieving sustainable competitive advantage through 1) quality management and 2) sustainable procurement practices. The study is conceptual and is based on an initial review of the literature and comparative content analysis of the two frameworks. A conceptual framework that integrates the two in order to achieving sustainable competitive advantage is proposed. The paper represents the first stage in a four-stage research study and the objectives and methodologies for subsequent stages are outlined.

### Introduction

The need to manage the movement of materials and flows of information for the achievement of wider objectives is not a twentieth-century phenomenon. Owing to the advancement of Eastern-Western trade in the Middle Ages and the military needs of large scale wars of the eighteenth and nineteenth centuries, the concept of managing a chain of supply was relevant long before the term 'supply chain management' was coined in the 1980s [1]. Since then, research in the field of Supply Chain Management (SCM) has steadily increased, with a significant growth since the late 1990s [1]. As companies have begun to focus on their core competencies and rely more heavily on suppliers for non-core activities, added-value is increasingly associated with supply chains' upstream activity. The opportunities for gaining competitive advantage through improved performance have thus been extended from the firm to the supply chain [2, 3, 4].

Handfield and Nichols [5] define SCM as 'the integration of all the activities that relate to the flow and transformation of goods, including associated information flows, from the raw materials stage right through to the end user by means of improved supply chain relationships, in order to achieve a sustainable competitive advantage.' As research into the links between SCM and firm performance evolves, researchers have begun to evaluate the benefits to be gained from the integration of SCM theory with other management theory. This can improve the execution of those particular supply chain 'activities' that will achieve sustainable competitive advantage. Thus we have seen the emergence of relatively new areas

of research, such as green supply chain management (GSCM) [6], supply chain quality management [7] and sustainable supply chain management (SSCM) [8]

Against this backdrop, this paper addresses two change programmes which have emerged with the aim of increasing the competitive advantage of the UK defence sector. It is a conceptual study based on an initial review of findings in academic and practitioner literature. It draws on select areas of research to underpin the proposal that integration of the change programmes within a single framework is achievable and beneficial. These key areas include quality management, supply chain management and sustainable procurement. It also looks at the benefits to be gained from integration of compatible systems.

The rest of the paper will be structured in the following way: first, the rationale and methodology for this study will be outlined, highlighting that this is a conceptual study in response to an existing defence sector strategy for achieving sustainable competitive advantage. It represents a preliminary research stage that underpins work to refine and test the proposed framework. A brief literature review is then conducted to highlight relevant theory on which the frameworks and the argument for integration are based. This is supported by findings of initial comparative content analysis and preliminary ethnographic discussions with participants in the two change programmes. A conceptual framework is then proposed, followed by indications of how the framework will be further studied and refined. Limitations and implications of the study are discussed before final conclusions are drawn.

### **Rationale and methodology**

This is a conceptual study addressing two leading defence sector change programmes which aim to help the UK defence sector achieve sustainable competitive advantage. While the two programmes differ in their primary goals ('quality' versus 'sustainable procurement') they align in their ultimate goal (the achievement of 'sustainable competitive advantage' for the UK defence sector). While neither programme is mandatory, many organisations have signed up to both. It is their mutual existence that therefore forms the rationale for this study. The aim of the paper is to propose a new conceptual framework that integrates the two, which can be used as a strategic tool by defence organisations for achieving the requirements and benefits of both.

The first is created by a defence sector trade association (ADS) and is known as Twenty First Century Supply Chains (or SC21) [9]. It was launched in 2006 and emphasises quality management within the supply chain through a number of well-known quality tools. It focuses on improving relationship management practice, achieving business and manufacturing 'excellence', a culture of continuous improvement and reward and recognition (Fig. 1).

The second change programme has been encouraged by the Ministry of Defence, (MOD). This focuses on achieving high levels of sustainable procurement practice throughout the supply chain; it is known as the 'Flexible Framework' [10]. This

framework indicates the requirements for achieving five progressive levels of advancement in relation to five key themes (Fig 2).

This paper constitutes a conceptual approach for achieving sustainable competitive advantage within the UK defence sector. It is predicated on secondary literature and data from ADS, MOD and findings in the academic literature relating to management theory and sustainable competitive advantage. The theoretical base has been supported by the findings of an initial comparative content analysis of the two frameworks. The results of a preliminary ethnographic study of SC21 and MOD participants are also touched on to illustrate strategy for further research stages. Upon these findings, a conceptual model which integrates the two frameworks is proposed.

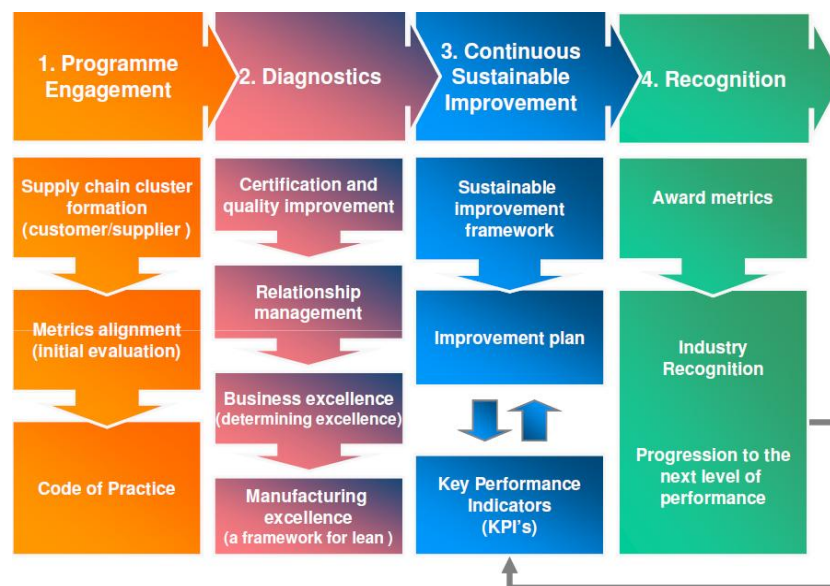


Figure 1 – SC21

(Source: ADS)

This paper forms the first stage of a four-stage research study. Stage two aims to refine the conceptual framework based on the findings of an exhaustive literature review, taking in to account empirical studies testing the links between quality management/ sustainable procurement and sustainable competitive advantage, in a supply chain context. This stage will also consider the experiences of analogous approaches to achieving sustainable competitive advantage in other industries, outside of the defence sector. Stage three will survey a cross-section of defence industry primes and tier 1 and 2 suppliers to see how the two frameworks are currently approached. Primary data will be triangulated with findings from stage two in order to further refine the framework. Stage four will test and validate the framework within a single supply chain case study, comprised of a defence sector prime, a Tier 1 supplier and a Tier 2 supplier.

	Foundation – Level 1	Embed – Level 2	Practice – Level 3	Enhance – Level 4	Lead – Level 5
People	Sustainable Procurement champion identified. Key procurement staff have received basic training in Sustainable Procurement principles. Sustainable Procurement is included as part of a key employee induction programme.	All procurement staff have received basic training in sustainable procurement principles. Key staff have received advanced training on sustainable procurement principles.	Targeted refresher training on latest Sustainable Procurement principles. Performance objectives and appraisal include Sustainable Procurement factors. Simple incentive programme in place.	Sustainable Procurement included in competencies and selection criteria. Sustainable Procurement is included as part of employee induction programme.	Achievements are publicised and used to attract procurement professionals. Internal and external awards are received for achievements. Focus is on benefits achieved. Good practice shared with other organisations.
Policy, Strategy and Commitments	Agree overarching Sustainability objectives for procurement. Simple Sustainable Procurement policy in place endorsed by CEO. Communicate to staff and key suppliers.	Review and enhance sustainable procurement policy, in particular consider supplier engagement. Ensure it is part of a wider Sustainable Development strategy. Communicate to staff, suppliers and key stakeholders.	Augment the Sustainable Procurement policy into a strategy covering risk, process integration, marketing, supplier engagement, measurement and a review process. Strategy endorsed by CEO.	Review and enhance the Sustainable Procurement strategy, in particular recognising the potential of new technologies. Try to link strategy to EMS and include in overall corporate strategy.	Strategy is reviewed regularly, externally scrutinised and directly linked to organisations' EMS. The Sustainable Procurement strategy recognised by political leaders, is communicated widely. A detailed review is undertaken to determine future priorities and a new strategy is produced beyond this framework.
Procurement Process	Expenditure analysis undertaken and key Sustainability impacts identified. Key contracts start to include general Sustainability criteria. Contracts awarded on the basis of value-for-money, not lowest price. Procurers adopt Government Buying Standards.	Detailed expenditure analysis undertaken. Key Sustainability risks assessed and used for prioritisation. Sustainability is considered at an early stage in the procurement process of most contracts. Whole-Life Costing analysis adopted.	All contracts are assessed for general Sustainability risks and management actions identified. Risks managed throughout all stages of the procurement process. Targets to improve Sustainability are agreed with key suppliers.	Detailed Sustainability risks assessed for high impact contracts. Project/contract Sustainability governance is in place. A life-cycle approach to cost/impact assessment is applied.	Life-cycle analysis has been undertaken for key commodity areas. Sustainability Key Performance Indicators agreed with key suppliers. Progress is rewarded or penalised based on performance relevant to the contract. Barriers to Sustainable Procurement have been removed. Best practice shared with other organisations.
Engaging Suppliers	Key supplier spend analysis undertaken and high sustainability impact suppliers identified. Key suppliers targeted for engagement and views on procurement policy sought.	Detailed supplier spend analysis undertaken. General programme of supplier engagement initiated, with senior manager involvement.	Targeted supplier engagement programme in place, promoting continual Sustainability improvement. Two way communication between procurer and supplier exists with incentives. Supply chains for key spend areas have been mapped.	Key suppliers targeted for intensive development. Sustainability audits and supply chain improvement programmes in place. Achievements are formally recorded. CEO involved in the supplier engagement programme.	Suppliers recognised as essential to delivery of organisations' sustainable procurement strategy. CEO engages with suppliers. Best practice shared with other/peer organisations. Suppliers recognise they must continually improve their Sustainability profile to keep the client's business.
Measurements and Results	Key Sustainability impacts of procurement activity have been identified. Simple measures based on achieving all aspects of the Foundation level of the flexible framework are put in place and delivered.	Detailed appraisal of the Sustainability impacts of the procurement activity has been undertaken. Measures implemented to manage the identified high risk impact areas. Simple measures based on achieving all aspects of the Embedding level of the flexible framework are put in place and delivered.	Sustainability measures refined from general departmental measures to include individual procurers and are linked to development objectives. Simple measures based on achieving all aspects of the Practising level of the flexible framework are put in place and delivered.	Measures are integrated into a balanced score card approach reflecting both input and output. Comparison is made with peer organisations. Benefit statements have been produced. Simple measures based on achieving all aspects of the Enhancing level of the flexible framework are put in place and delivered.	Measures used to drive organisational sustainable development strategy direction. Progress formally benchmarked with peer organisations. Benefits from Sustainable Procurement are clearly evidenced. Independent audit reports available in the public domain. Simple measures based on achieving all aspects of the Leading level of the flexible framework are put in place and delivered.

Figure 2 – MOD Charter Flexible Framework

(Source: DEFRA)

## Literature

It has been acknowledged that while the number of available sources by which a firm can gain competitive advantage and therefore grow and survive is limited, one emerging means by which an organisation might excel lies in becoming a 'sustainable' organisation [4, 11]. The concept of 'sustainability' is broad, however and can provide a variety of definitions for a variety of stakeholders. The most often cited definition is that found in the Brundtland report [12]: *'Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.'* The balancing of the three elements of 'people', 'planet' and 'profits' – stemming from John Elkington's 'Triple Bottom Line' [13] – is also a popular conceptualization of sustainable development. This has suggested that an organisation can create more value over the long term, while encountering fewer risks or harm, if its impact on economy, environment and society are considered in equal measure.

In their focus on improving supply chain performance within the UK defence sector, both SC21 and the MOD Flexible Framework reflect 'sustainability'. For the MOD, their goal is the achievement of sustainable competitive advantage through sustainable procurement. The MOD defines sustainable procurement as *'a process whereby organisations meet their needs for goods and services in a way that achieves value for money on a whole life basis in terms generating benefits not only to the organisation, but also to society and the economy, whilst minimising damage to the environment'* [14]. By contrast, the term 'sustainability' features infrequently in the SC21 literature. In its commitment to achieving high quality standards, however, the benefits to be gained not only include improved on time-in full (OTIF) delivery rate; a 'right first time' culture; cost-reduction through leaner production, but also indirect environmental benefits associated with waste-reduction [9]. Both programmes emphasise achieving sustainable competitive advantage in economic terms above social and environmental terms. This study therefore takes an economic perspective of sustainability and acknowledges the programmes' links between quality management-sustainable competitive advantage and sustainable procurement-sustainable competitive advantage.

The similarities between quality management (QM) and Supply Chain Management (SCM) regarding philosophical perspectives, goals and processes have been recognised. Some authors have subsequently surmised that the inclusion of quality management principles within the supply chain can have a positive effect on a firm's performance and its ability to sustain its competitive advantage [15, 16]. An emerging area of study termed 'Supply chain quality management' (SCQM) represents a shift in focus from internal product-orientated quality management practices to external process-orientated supply chain quality management practices [17]. Within sectors that rely more heavily on supply chain partners due to the need for supply of specialised components, such as the Automotive Industry, this has been found to be particularly prevalent [16]. In light of this, an organisation's procurement function has been considered key. Research

has shown the benefits to be gained from the integration of quality management practices within purchasing activities for achieving sustainable competitive advantage. As products purchased are a source of variability, they have the potential to impact on the quality of the final product [18]. Some of the dimensions that have been identified by studies of Quality Management in the purchasing function include: personnel management from a quality perspective; benchmarking practises; the strength of purchasing managers' commitment to quality; the integration of the purchasing function with other functional areas of the business, in the interest of quality, as well as supplier quality management [18]. A number of these dimensions are similarly identifiable in the MOD's Flexible Framework for achieving sustainable procurement.

The literature indicates that an ongoing evolution of the concepts of supply chain management, sustainability, quality management and procurement –all broad areas of academic research– has seen a significant blurring of conceptual boundaries and a broadening of conceptual definitions. Handfield and Nichols' [5] definition above implies a significant causal link between effective SCM and sustainable competitive advantage. SCM is no longer simply a short-term functional process. In this context, the relevance of integration of SC21 and Flexible Framework based on their compatible is implied.

Both frameworks seek to offer practical means for improving the UK defence sector supply chain and while they differ in their primary goals ('quality' versus 'sustainable procurement') they align in their ultimate goal (the achievement of 'sustainable competitive advantage' for the UK defence sector). They are both predicated on methodologies relating to business improvement and although both are voluntary, the degree to which they have been endorsed by signatories on and since their respective launch dates indicates the value they have been attributed by defence industry primes and suppliers alike. The exact nature of this value is as yet unclear and further survey-based data-gathering is to be undertaken (during stage two of the research study) to ascertain: 1) how the value of each framework is understood, 2) why organisations signed up to one/both of them, 3) how effective they have been in achieving the espoused benefits, and 4) what the barriers to implementation have been. Initial ethnographic findings to date indicate that the value is attributable to order-qualifying, order-winning and reputational motives and that some barriers to implementation (include lack of clarity and lack of management commitment) have been experienced. These issues will be explored more in subsequent research stages.

### **The case for integration – benefits and barriers**

A number of studies have indicated the benefits to be gained from integration of management systems [19, 6]. For example, the similarities to be found in the drivers, dimensions and implementation practices of Quality Management (QM) and Environmental Management (EM) systems have lent themselves well to the evolution of Quality Environment Management (QEM) systems [19].

An initial comparative content analysis of SC21 and the Flexible Framework has highlighted common dimensions and implementation practices. The common dimensions include:

1. Stakeholder engagement –particularly customers and suppliers.
2. Shared Value
3. Process improvement,
4. Customer focus,
5. People management
6. Top management commitment/leadership,
7. Planning
8. Information availability and analysis.

Common implementation practices have similarly been found, including:

1. Diagnostic tools (such as life cycle analysis, manufacturing excellence, business excellence (7W/5S)
2. Training
3. Permanent self assessment
4. Recognition and rewards.

These commonalities imply the relevance of integrating the two into a single framework for simultaneous implementation. In light of other findings relating to integrating management systems, the benefits to be gained from integration include:

1. Avoidance of duplicated efforts
2. Reduced bureaucracy
3. Alignment of goals and resources
4. Reduction of costs caused by internal / external audits
5. Enhanced communication and information sharing
6. Development of shared value through focus on a single system.
7. Environmental improvements through reduced waste

In addition, it is proposed that the benefits to be frameworks can be integrated and practically implemented to achieve such benefits not merely due to commonality but due to causality. The dimensions identified in SC21 may enable the achievement of requirements listed in MOD Flexible Framework.

SC21 and MOD Flexible Framework are evidence of a trend which has seen performance measurement models increasingly employed as strategic tools for internal business improvement [20, 21]. The European Foundation for Quality Management (EFQM) model is one such example which offers a guidance framework by which organisations can assess and improve their levels of business excellence. The model is now used in approximately 30,000 organisations (of all sizes and sectors) across Europe [22]. Many use the framework with no intention of pursuing the associated Excellence Awards, indicating the prevalence of the use of strategic management tools for self-auditing and improvement. The EFQM

model has thus been chosen as a basis for the conceptual framework which integrates SC21 and the MOD Flexible Framework, taking SC21 as the 'Enablers' and MOD Flexible Framework as the 'Results' (Fig 3).

The EFQM model is based on the assumption that 'Excellence' is enabled by an organisation's 'Leadership', 'People', Policy and Strategy', Partnerships and Resources' and 'Processes'. These five 'Enablers' lead to excellent results in terms of the experiences and perceptions of the organisation's 'People', 'Customers' and 'Society' as well as the organisation's 'Key Performance Indicators'.

The conceptual framework (Fig 3) takes the four stages of SC21 (Programme Engagement; Diagnostics; Continuous Sustainable Improvement; and Recognition) and indicates them as the enabling factors on the left-hand side of the framework. The right hand side of the framework shows the five themes of the MOD Flexible Framework (People; Policy, Strategy and Communications; Procurement Process; Engaging Suppliers; and Measurements and Results) and their associated five levels of advancement. These constitute the 'Results'.

It is therefore proposed that the common dimensions represent causal relationships - the MOD Charter represents a desired state that drives the implementation of SC21 which thus enables the achievement of MOD requirements. The conceptual framework (Fig 3) retains this cyclical element and reflects the continuous improvement dimension that is seen in SC21, MOD Flexible Framework and EFQM, through iteration at two points. The link between SC21's 'Continuous Sustainable Improvement' and 'Recognition' stages of SC21 is indicated by the arrows connecting the central boxes in Figure 3. This reflects the iteration proposed by the feedback arrow in the SC21 Framework (Fig 1). The double-headed arrow running the bottom length of the conceptual framework (Fig 3) reflects the iteration that occurs to advance up the five-levels of the MOD Flexible Framework. This similarly reflects the EFQM model's feedback loop from 'Results' to 'Enablers' to embed a culture of continuous improvement within any organisation that is striving for excellence.



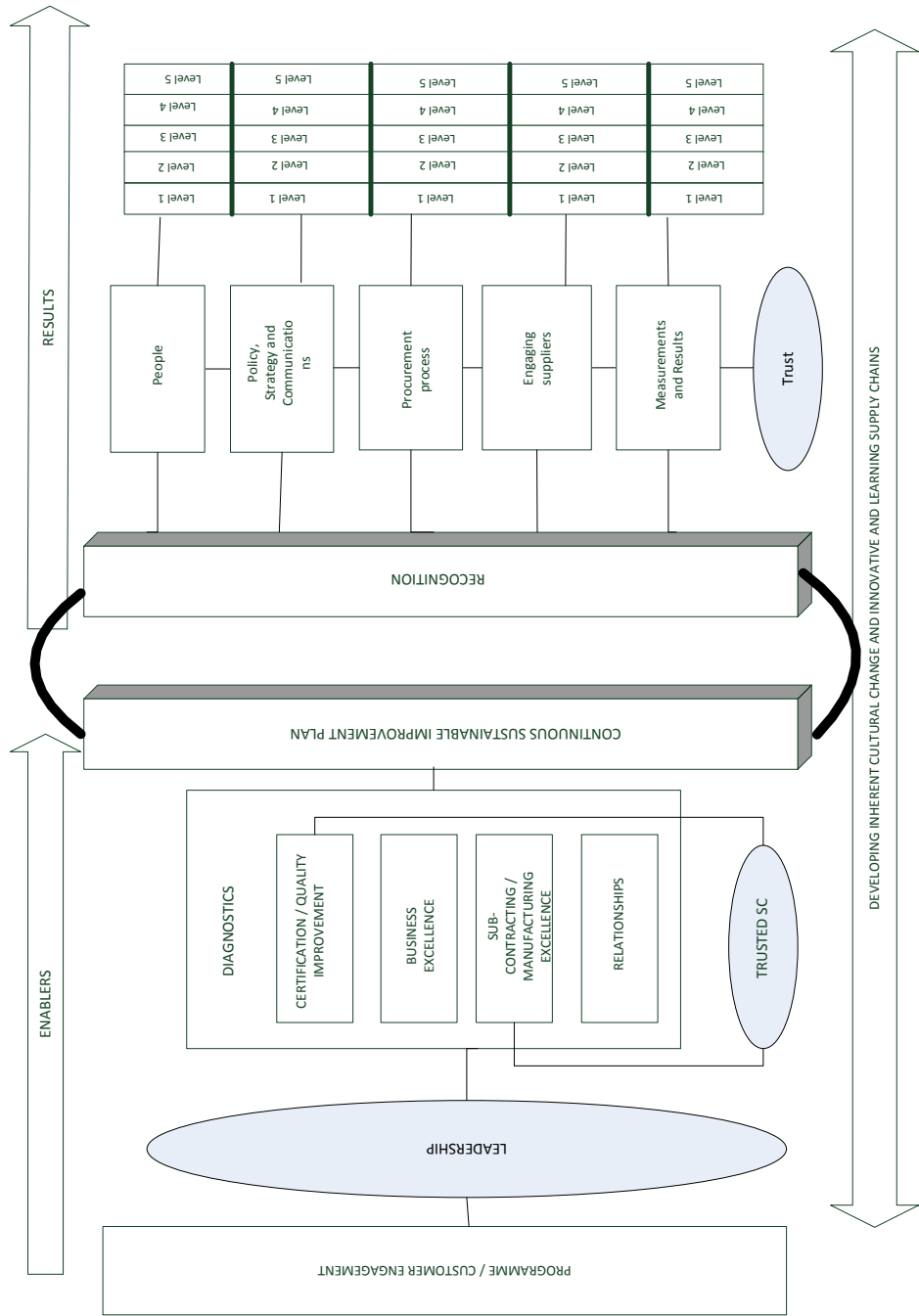


Figure 3 - A new model for achieving sustainable competitive advantage in the UK defence sector

To date, attempts have been made to retain the integrity of both SC21 and MOD Flexible Framework while conceptualising the integrative framework. A few variations can be seen, and are based on initial ethnographic findings with the case supply chain prime. The 'Manufacturing Excellence' element of SC21 is insignificant for an organisation that does not manufacture but subcontracts. 'Subcontracting excellence' has therefore been added as an alternative to 'Manufacturing excellence'. The elliptical shapes within the conceptual framework (Fig 3) reflect additional dimensions ('Leadership' and 'Trust') that have been considered important by the case supply chain prime. While management commitment is a dominant concept in both change programmes, 'leadership' has been identified as an important complementary concept that underpins organisational or supply chain transformation. Similarly the concept of 'trust' is deemed key in the context of supply chain relationships [23] – not least in the defence sector [24].

These initial findings have been acknowledged by inclusion in the conceptual framework at this stage (Stage 1) of the research study because they reflect an important additional consideration for the integration and implementation of the conceptual framework. They identify a need to acknowledge an organisation or a supply chain's pre-requisites for adapting the framework in order to achieve optimal performance. This will be considered in more depth via the second and third stages of the study, as outlined in more detail below.

### **Further Research**

The paper represents stage one in a four-stage research study.

Stage two will conduct an exhaustive literature review that accounts for previous empirical studies in these broad areas of research. This stage will also take into account analogous industry-led approaches to achieving sustainable competitive advantage from outside of the defence sector. It will look at public and private sector comparators including public and private sector approaches. From this a more detailed understanding of the fundamental mechanisms required for integration will be gained. This will include further study of the potential benefits and barriers to implementation.

Stage three will survey a cross-section of defence industry primes and tier 1 and 2 suppliers to see how the two frameworks are currently being approached. The survey will seek to understand: 1) how the value of each framework is understood, 2) why organisations signed up to one/both of them, 3) how effective the frameworks (once implemented) have been in achieving the espoused benefits, 4) what the barriers to implementation have been and 5) how these barriers have/have not been overcome. Potential barriers to the implementation of an integrated framework will likely reflect existing barriers to the achievement of either/or SC21 and MOD Flexible Framework. Initial ethnographic findings suggest lack of clarity; mis-alignment of understanding at strategic and operational levels; lack of internal expertise; institutional inertia and cynicism have been experienced to date. This will support a refinement of the conceptual framework and its potential for practical

implementation. This stage will also enable a greater understanding of organisational and supply chain-specific considerations that require adaptation of the framework in line with organisational pre-requisites.

The final stage (stage four) will consist of an in-depth analysis of the conceptual framework within a single supply chain case study. The case supply chain will consist of a single prime organisation and two tiers of suppliers. It will use deductive reasoning to implement, test, amend and refine the framework in an iterative process. The output of this will be a robust and practical model for the achievement of sustainable competitive advantage for the UK defence sector.

### **Implications**

A study of the links between these two frameworks and the potential for integration has not, to the authors' knowledge, previously been undertaken. The study contributes to theory and practice and has implications for researchers and practitioners alike. For researchers, the paper has sought to contribute to understanding of the integration of SCM, quality management, sustainable procurement and sustainability initiatives in the achievement of sustainable competitive advantage. For defence sector managers, the paper has sought to outline the potential that exists for developing a practical means for implementing two high-level change programmes that are unlikely to be ignored. As has been mentioned, neither of the change programmes is mandatory yet there appears to have been significant responses from industry primes and SMEs alike. There exists the potential for each to become important order-winning or order-qualifying criteria, and thus has implications for individual organisations' ongoing business. However there also exists the potential for the full anticipated benefits of SC21 or the MOD Charter's Flexible Framework to be unachievable without commitment at each tier of each supply chain. It is suggested that the integrative framework would need to be mandatory in order to be truly successful.

### **Limitations**

The study acknowledges and reflects the focus on economic sustainability that is present in SC21 and MOD Flexible Framework. The social and environmental aspects of sustainability in the supply chain, including the benefits of these perspectives on competitive advantage, have not been considered. Andrew et al (2012) suggest this could mean failing to achieve the full potential of competitive advantage. Analysis of SC21 and MOD Flexible Framework from a truly triple bottom line perspective to assess (and suggest ways to address) the imbalance would be fruitful. This would have implications for the conceptual integrative framework but such research falls outside the scope of this paper and study.

### **Conclusion**

The aim of this paper has been to outline a conceptual framework that integrates two existing change programmes in order to achieve sustainable competitive advantage within the UK defence sector. An initial review of academic and

associated secondary literature suggests that integration is achievable and beneficial. This has been supported by findings from an initial comparative content analysis and ethnographic discussions, but further research is required to refine, test and validate a robust model for implementation. This will be achieved via the three subsequent stages of the research study.

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